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AMERICAN INDUSTRIES.—No. 42.

A SHIRT AND COLLAR FACTORY.

That a business of this kind could ever grow into a really important and considerable branch of American factory industry would never have been thought possible by our grandfathers. In fact, most men of middle age can remember when they shook their heads at the idea of buying ready-made shirts and collars, for the making of these necessary garments seemed an indispensable part of the duty of all exemplary wives and daughters, and any young woman who had not proved her capabilities in this direction was supposed to have had a faulty "bringing up." The advent of ready-made clothing and ready-made boots and shoes, however, was soon followed by that of ready-made shirts, collars, and cuffs, the manufacture of which, in a wholesale way, has been for some years a business of considerable consequence.

In the illustrations which are presented below are seen the principal departments in a representative factory of this description—that of Geo. P. Ide, Bruce & Co., Troy, N.Y. In a business of this kind, where all the details of the work are such as almost every one is more or less conversant with, it necessarily follows that success is possible only by giving the closest attention to every item, so that, in the division of labor, in the cutting of stock, in the oversight of the great number of hands employed, both in and out of the factory—in a number of things that seem little in themselves—there be no room for waste, and the whole work shall move like one great machine, and always with the greatest possible economy. It is only in such a way that sufficient margin of profit can be figured out to support a business of this nature, where each individual customer could with little difficulty supply himself with the articles made, and would do so if the factory system did not produce them a little cheaper as well as better than the average of home-made goods. How this firm have succeeded in this line is best evidenced by the steady growth of their business and the great dimensions it has attained, their product for one year having exceeded that of one of the largest and oldest iron foundries in Troy. Their regular manufacture, during the busy season, amounts to 200 dozen shirts and 2,000 dozen collars per day, and so complete are the facilities of the establishment, so ample are their arrangements for obtaining the large number of hands wanted, that even this great production could be exceeded if the wants of the trade should seem to call for such enlargement.

In the cutting department, as shown in the view on the right hand at the bottom of the page, there is room for spreading 6,000 yards of cloth at a time on the long tables. This work is all done by men, who use a knife particularly adapted for the purpose, known as the shirt-cutters' knife. Wood patterns are used, and 48 thicknesses of cloth are cut through at one time. Dies cannot be economically used for this purpose, as the springing of the cloth would cause more waste. Irish linen is principally used for the collars and cuffs, and the rags from this sell at the same price as those from the white muslin for the shirts, about twenty-five tons a year being made, which are sold to the paper manufacturers for making the finest ledger paper. Both white and colored shirts, of many different styles, are made; but in the latter class it is intended to keep the production close down to the actual immediate wants of the trade, as white goods only are staple, and sure to be in demand all the time. As many as eighteen different patterns are sometimes required for one size of shirts. The collar cutting includes

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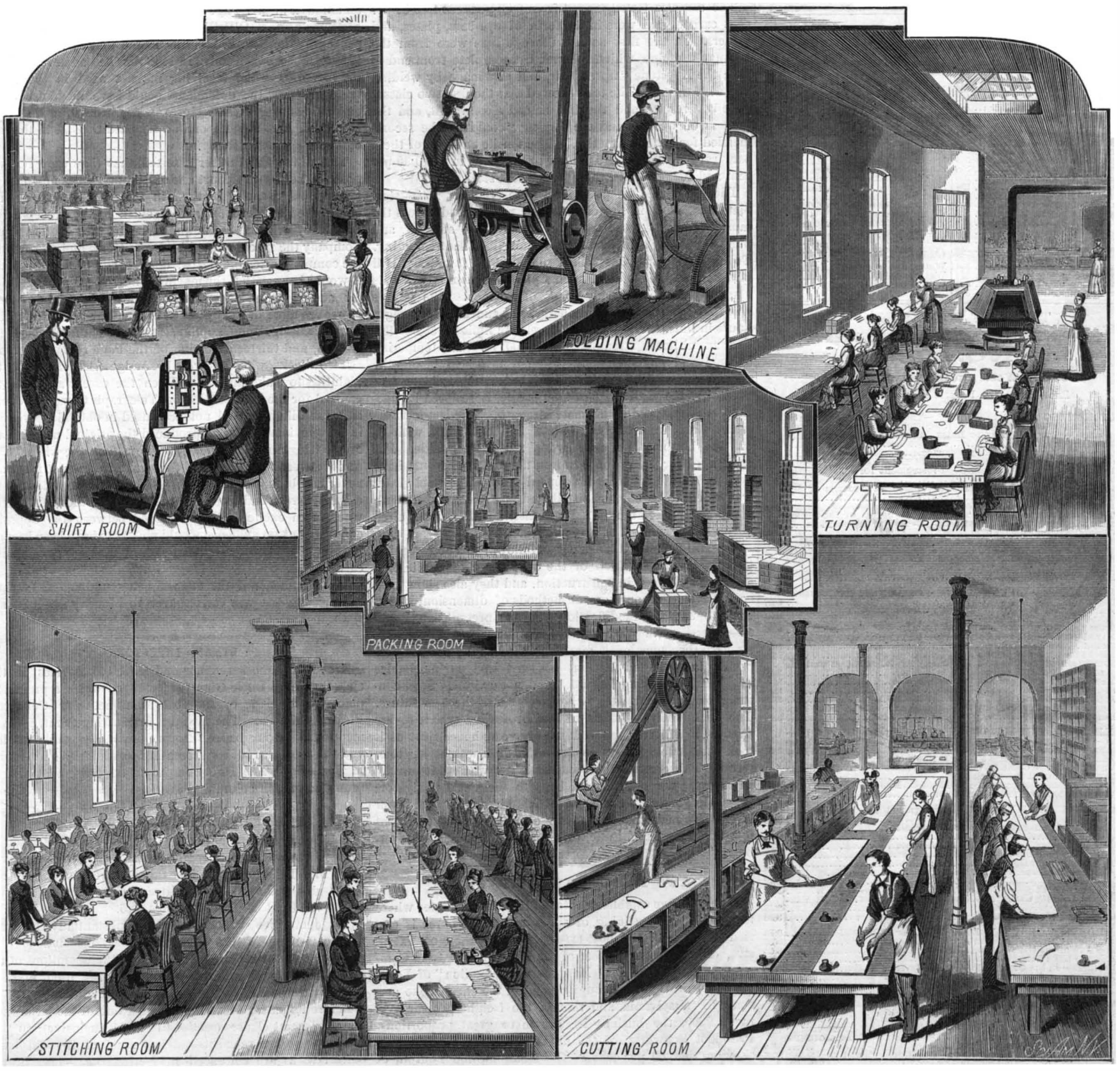

MANUFACTURE OF SHIRTS AND COLLARS.—GEO. P. IDE, BRUCE & CO., TROY, N.Y.

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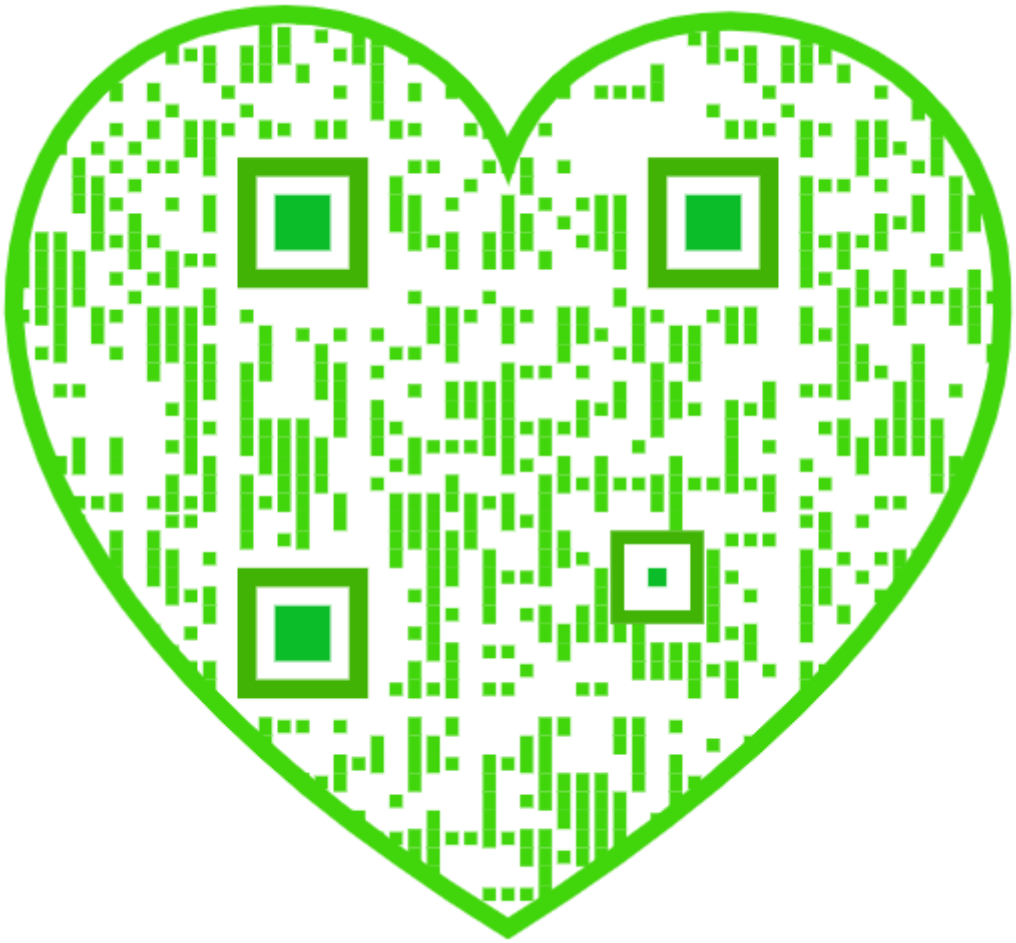

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NEW YORK, SATURDAY, MAY 15, 1880.

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THE USE OF STEEL FOR STRUCTURAL PURPOSES.

At the last meeting, in Pittsburg, of the Engineers' Society of Western Pennsylvania, the subject which most interested the iron and steel men of Pittsburg was the topic ably handled by Mr. A. F. Hill, C.E., of New York, in his paper entitled "Steel in Construction." The points presented embodied a series of interesting tests conducted by the gentleman named, with open hearth Pittsburg steel from the establishment now supplying the steel for the wire used in the East River Bridge cables. These experiments were conducted at the works of the Keystone Bridge Company, Pittsburg, at J. M. & J. B. Cornell's works, New York, and at the United States testing machine at Watertown, N. Y. Following are the salient points in Mr. Hill's paper:

"Within the past few years there has been developed in this country a tendency toward steel construction, which today is so pronounced as to command the most thoughtful consideration alike of constructors and manufacturers. The adaptability of steel to purposes of construction is probably no longer questioned, yet there is still a certain distrust of the material in minds of many thoughtful men, who believe steel to be endowed, more than any other material, with that exasperating quality which might fitly be called the 'innate cussedness' of inanimate objects. This arises undoubtedly from some of the remarkable and seemingly inexplicable failures which have occurred in finished parts of steel, some of them breaking under loads utterly inadequate to produce rupture, others breaking in some instances without any apparent cause at all. I use the expression 'seemingly inexplicable' advisedly, for I believe that every such extraordinary failure is susceptible of rational explanation, and can almost invariably be traced, not to the inherent defect in the material itself, but to the wrong treatment of the steel during the process of manufacture into parts of the structure. I propose to lay before you the results of some steel tests made under such conditions as would naturally arise when the material is to be used in a structure."

The samples tested ranged from 0·30 per cent to 0·50 per cent carbon, and were in the form of eye bars, plates, and girders. In the first named, the eye bars were from the Kloman machine, which rolls the bar complete from end to end; the Keystone "upset" bar, and bars made by welding and die forging. The tests showed that the first two classes gave best results, and the last named second best, and the process of welding and die forging "could not be recommended for general practice." The tensile strength of these bars ranged from 93,000 lb. per square inch in the 0·30 per cent and 102,000 lb. in the 0·50 per cent steel.

The tests made on plate steel were crucial. A ¾ steel plate was tested in the direction of rolling, and across the same; also as to the relative strength of sheared and punched plates, and the effects of annealing and tempering. To ascertain just what such a plate, would stand, Mr. Hill punched out the edges of such a plate and then reduced its gauge by cold hammering to $\frac{1}{8\,2}$ of an inch. The sample was then heated to a bright cherry, and annealed forty-eight hours in lime. A test showed an elastic limit of 55,000 lb., and an ultimate strength of 100,400 lb. In tempering sheared and punched plates from a low heat in oil, the effect was contrary to what might be expected; instead of rendering the material hard and brittle, it restored its ductility and increased its ultimate strength. The last test was with a steel girder of $\frac{3}{16}$ web plate, 12 inches high, with $\frac{3}{16}$ top and bottom plate, and $\frac{5}{16}$ 2½ x 2½ steel angle. For such a girder (6 feet long) in iron the test load would have been not quite 22 tons distributed load. The steel girder was tested up to 65 tons distributed safe load; and under a continued application of 103 tons distributed load, acquired only a permanent set of half an inch.

Mr. Hill concluded his paper as follows: "The foregoing tests are a fair indication of the wide range of application steel is capable of in construction, and they also show very conclusively that our present methods of dimensioning will have to undergo modification; that our present safety factors, based as they are entirely upon an assumed ultimate strength, become almost meaningless when we have to proportion in steel; and last but not least, that our mechanics must learn to test steel as steel, and not as iron. Steel construction is undoubtedly *the* construction of the near future. The conservative element in our profession which to-day opposes it will still oppose it twenty years hence, just as it took them twenty years to learn that iron was better than wood. This conservative element is not without its use by any means; nor are the sand bags to the aerial navigator; they help to steady the flight of his air ship at the lower levels. To make the comparison complete, let me add, that to reach a higher altitude, they must both be thrown overboard."

TWO TONS OF SILVER PER WEEK.

There are five establishments in the United States where the smelting and refining of silver-bearing lead ores is carried on. One of the most extensive, if not the most extensive, of these works is that of the Pennsylvania Lead Company, of Pittsburg, Pa. Here the "base bullion" of Leadville and of Utah is brought to meet the cheap coke and coal of Pennsylvania, and though the freight per car averages $300, the business has grown to great proportions. President Schwartz, of the above company, gives figures showing that 60 per cent of the "base bullion" output of Leadville is shipped to the Pittsburg refining works, besides 75 per cent of the output of Utah lead mines. "Base bullion" is the product of the ore smelters of the mining regions, and bears about the same relation to refined silver as pig metal to refined steel. At the Pittsburg refining establishment this base bullion is converted into lead, silver, and gold. The precious metals find their way to New York, while the lead is consumed by the makers of white lead. The Utah ores are the richest in gold, sometimes reaching 40 ounces per ton. Of silver, the Pennsylvania Lead Company ships 50,000 ounces per week, or two tons, representing in value, at $1.14 per ounce, $57,000. This metal leaves the works in pretty bars of 2,000 ounces each.

THE TELEGRAPH SET SCREW.

The decision of Judge Blatchford sustaining the Page Electrical Patent was noted in our issue of March 6.

April 4 Judge Blatchford heard motions by the American Union Telegraph Company, the Wabash, St. Louis and Pacific Railway Company, and the Union Pacific Railway Company, praying to have the decision referred to so modified as to exempt them from the payment of royalty to the Western Union Telegraph Company, on the grounds that they have always used the machine and devices invented and patented by Prof. Morse, and that it could be proved that the original Morse instrument on exhibition in the office of the Western Union Telegraph Company was made by Prof. Morse as early as 1835, and contained all the essential parts of the apparatus and devices set forth in the eleventh, twelfth, and thirteenth claims of the Page patent.

The petitioners allege further that the defense in the previous suit could have proved (though they did not) that the testimony of Page in the suit of French against Rogers related to these essential parts of the Morse apparatus and devices; they could have proved by Thomas Hall of Boston that in 1847 he manufactured a machine under the Morse patent, which contained a device and combination adjusting or regulating the length of the vibration at the armature of an electro-magnet by means of a set screw as described in the 13th claim of the Page patent; they could have produced an affidavit of Mr. Page himself, taken in 1848, in the suit of Morse against O'Reilly; also, the defendants could have proved by the Rev. S. Irenæus Prime that Mr. Page wrote to the Hon. Amos Kendall in 1848 that he had never claimed the invention of the receiving magnet used in the Morse telegraph; and the defendants could have made use of the depositions of Professor Morse, taken in 1850, in the suit of French against Rogers, and of Leonard D. Gale in the suit of Morse against O'Reilly.

The petitioners further asserted that they were ready to produce before the court one of the machines now and for many years past used by them in telegraphing, and the machines used by Mr. Hall, and if aided by the process of the court they will cause to be produced by the Western Union Company the machine used by Prof. Morse and presented to the company after his death; upon a comparison of which it would be seen that the machines now used by the petitioners and that made by Mr. Hall and that used by Prof. Morse are alike in their essential parts, and that all of them have the designs and appliances mentioned in the eleventh, twelfth, and thirteenth claims of the Page reissued patent.

Two weeks were allowed by Judge Blatchford for the plaintiffs to make answer. When the case was called the counsel for the Western Union Telegraph Company denied that due diligence had not been used in obtaining evidence in the previous trial, and produced the original model of the Morse telegraph instrument, to show that the disputed set screw governing the play of the armature was not there and never had been. It was held by the opposite side that the original screw had been removed and another substituted, whereat an excited colloquy ensued between the opposing counsel; but no evidence would appear to have been brought to show the real function of the screw which the model now carries.

The arguments of the counsel being unfinished for lack of time, the case was carried over to Monday April 26, and again to April 30.

STEAM INJECTORS.

Among the most reliable and effective devices in this class the Rue's Little Giant Injector occupies a prominent place. It is made by the Rue Manufacturing Company, Philadelphia, Pa. The lawsuit for infringement, recently mentioned in our paper, has, we learn, been fully settled, and the company is now increasing its facilities and extending its sales. The Rue Company's advertisement will be found in another column.

THE REGISTRATION OF TRADE MARKS.

A bill to provide for the registration and protection of trade marks was passed by the House of Representatives, April 27. It included the first thirteen sections of Bill No. 5088, submitted by the Committee of the Judiciary as a substitute for H. R. 2573, and H. Res. 125.

The committee sought to re-enact substantially the trade mark legislation of 1870 (Rev. Stat., sections 4937–4947 inclusive) with the act of 1876, save that the operations of the proposed law were confined to trade marks used in commerce with the Indian tribes and foreign nations.

Before its passage the House struck out all the penal and search-warrant clauses (sections 14 to 21 inclusive); so that the proposed law re-enacts only so much of the old trade mark laws as are embraced in sections 4937–4942 of the Revised Statutes.

The bill as passed also provides that applicants for regis-

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tration under it shall be credited for any fee, or part of a fee, heretofore paid by them into the Treasury of the United States with the intent to procure protection for the same trade mark, and that citizens wishing to register trade marks in foreign countries, where prior registration here is a condition precedent to registration there, may register here for such purpose.

RECENT TELEPHONE EXPERIMENTS.

At the suggestion of one of the proprietors of this journal —Mr. A. E. Beach—a series of interesting experiments relating to the electrical transmission of sound has lately been commenced in this vicinity, which seems likely to lead to a variety of useful results. In the introductory experiment the SCIENTIFIC AMERICAN office and Mr. Beach's dwelling, in the upper part of this city, were connected by wire with the auditorium of Plymouth Church—Rev. Henry Ward Beecher's—in Brooklyn, N. Y., and these points were also telegraphically joined by the wires of the Bell Telephone Company and those of the Gold and Stock Company, the electrical circuit being thus enlarged and ramified in all directions, communicating with offices and dwellings in New York, Brooklyn, Jersey City, Newark, Orange, Elizabeth, Yonkers, and other adjacent places. One object of the experiment was to determine approximately through how many united circuits and lines the voice of a public speaker might be simultaneously transmitted.

At Plymouth Church, in Brooklyn, the wire passed under the floor to the platform or pulpit, where it connected with two of the well known Blake transmitters, arranged upon a shelf under the speaker's desk. The general arrangements for the experiments were under the charge of Mr. Frederick C. Beach, Ph.B., of the SCIENTIFIC AMERICAN office.

When it became known at the Bell telephone office in Brooklyn that experiments were to be tried, the interesting news soon spread to all of the other telephone offices, and the various operators not only called into their offices parties of their friends to enjoy the treat, but gave notice to numbers of private persons having communicating wires, who in turn invited friends to their dwellings. Thus at many points on the great ramification of connecting wires were groups of persons waiting, with telephones at their ears, to hear the words of the distinguished speaker. At one of the stations fifteen telephones were in this way connected, the instruments being joined by wires, just as a circle of people join hands in sharing an electrical shock.

The first experiment was made on Sunday, April 18, and was on the whole perhaps more successful than could have been expected. The telephone listeners stationed in Brooklyn, and nearest the church, were enabled to hear the service with much satisfaction; but those in New York, Yonkers, and Orange, N. J., only heard the music and portions of Mr. Beecher's sermon. It was concluded on the whole that there were too many telephones in circuit; and it was subsequently ascertained that the wire leading to the church had been surreptitiously tapped where it passed over a dwelling, a ground made on the tin roof, and a considerable number of telephones smuggled in.

On the following Sunday, April 25, another trial was had, precautions having been taken not to allow so many tapping lines or instruments in circuit. Special care was also taken by Mr. Adee, the adjuster of the Bell Telephone Company, to give the most delicate adjustment to the transmitting instruments at the church. The result was most successful and marvelous.

From the opening note of the organ prelude to the last word of the preacher's voice, at the close of the service, everything was delivered to the ears of the listening telephoners in the most perfect manner, the tones that came over the wires being so full, round, clear, and distinct, it almost seemed to the hearers in New York, Yonkers, and Elizabeth as if they were stationed within the church itself directly in front of the speaker.

The delivery of the music was equally perfect, every note of the organ and of the individuals of the choir being fully brought out. The majority of the participators in this experiment were persons accustomed to the use of the telephone, and their unanimous verdict was that the results obtained far surpassed anything of the kind within their previous experience.

In consequence of the successful progress of these experiments, several new improvements have been suggested for trial, and there seems to be every probability that in a short time some new and very effective instruments will be in use, by which all who desire may carry the sounds of church services into their dwellings, and may also enjoy the best lectures, musical and other entertainments with the utmost satisfaction in their homes. Heretofore, in listening to the telephone, it has required effort and strain of the ear on the part of the listener. But this experiment shows that all sounds may be delivered in full and easy tones, readily heard, with all the natural characteristics, modulations, and inflexions of the human voice.

We shall keep our readers informed of the further results accruing from this series of experiments. With the continued co-operation of the various electricians and managers of the lines it is believed that something of value to science may be adduced.

The progress and success of the experiments up to the present time have been greatly promoted by the active interest taken and assistance rendered by the gentlemen connected with the several telephone companies, to all of whom we return our sincere thanks. We are under especial obligations to Mr. C. F. Wiley, Superintendent of the Gold and Stock Company; to Mr. H. R. Butler, Secretary of the company; to Mr. T. G. Ellsworth, Electrical Manager of the company, through whom the experimental circuits were in the first instance arranged; to Mr. Henry W. Pope, Superintendent of the Bell Telephone Company; to Mr. E. T. Greenfield, Assistant Superintendent; to Mr. C. N. Chinnock, Electrician of the company; to Mr. D. M. Adee, Adjuster of the company; to Mr. Robert Brown, Superintendent of Construction; Mr. Grinsted, of the Orange office; Mr. William Hanford, manager of the Brooklyn office; Mr. Charles Walton, manager of the Nassau-street office, N. Y. Mr. R. W. Macgowan; also to Col. Wm. H. Paine, C. E., and to C. C. Martin, C. E., Assistant Engineer of the great Suspension Bridge between New York and Brooklyn, for permission to lay a temporary experimental wire across the foot bridge.

THE COFFEE PRODUCT.

From an exhaustive review of the coffee trade of all countries by the managers of the Java Bank (Batavia), it appears the total crop of the world for 1855 was 330,165,000 kilos; for 1865, 421,950,000 kilos, and that the average of the three years 1876-7-8 was 490,840,000 kilos. The figures represent an increased consumption of 27 per cent over fifteen years ago, and of 47½ per cent over 1855. In the Dutch Indies the increase since 1855 has been below the average rate in other countries. In the British Indies and Ceylon the crop has nearly doubled. The total for Asiatic countries is in about the average ratio for the whole world. Brazil falls somewhat below the average ratio of progress; and the same is true of the West Indies; while the most notable increase is in the case of Central America, where the crop has risen from 3,500,000 kilos in 1855 to 32,500,000 in 1876-8. In the South American countries other than Brazil the production has risen from 22,300,000 kilos to 35,900,000, which also is above the average ratio.

It may not be generally known that Guatemala produces some of the best coffee that is grown in any country; but such is the fact. From the plantation of Mr. José Guardiola, of Chocola, there has been sent to New York, the past year, a grade of coffee surpassing in quality either Java or the celebrated Mocha. The kernel of the Guatemala coffee is small and plump, resembling the best quality of wheat and but little larger.

Mr. Guardiola has introduced drying machines of his own invention, which enables him to cure his coffee in wet as well as sunny weather, and he has also patented in this and other countries a hulling and polishing machine, which he uses with great success on his extensive plantation. To the introduction of these machines is no doubt attributable the preservation of the delicious flavor and aroma of Guatemala coffee. Coffee growers in other countries will do well to introduce Mr. Guardiola's machines on their plantations.

IMPROVED TELEPHONE CENTRAL OFFICE SWITCH BOARD.

On page 15 of the current volume of this journal we illustrated and described one of the largest telephone central offices in this city, and alluded briefly to an improved switch board invented by Mr. T. G. Ellsworth, manager of the office. This switch board has been in use for a number of months, saving a great deal of labor and greatly facilitating the business of the office. A patent has just been issued to Mr. Ellsworth for this improvement. The invention consists in a board provided with a number of longitudinal bars used to connect the wires of the different subscribers. When these bars are in use they are turned to indicate that they are occupied, so that the switchman may know at a glance which rods are unoccupied.

This switch board has proved its utility by long use, and is especially adapted to small exchanges, and may be easily and cheaply applied.

Wind Pressure.

At a recent meeting of the Scottish Meteorological Society, Mr. St. John Vincent Day, C.E., spoke upon the great importance to engineers and bridge builders of having accurate records of the velocity of the wind. Having seen remarks in the newspapers that the Forth Bridge had been passed by the railway authorities and the Board of Trade, he had made inquiries respecting the calculations on which it had been based, and he had found, on the authority of the Astronomer Royal, that only 10 lb. per square foot had been allowed for wind pressure. Engineers had considered the matter, and he believed they had reported that with regard to wind pressures they had found nothing upon which they could place any dependence, except the old tables of Smeaton, which put down the pressure of the wind at from 7 lb to 12 lb. and 13 lb. to the square foot. Numerous wind pressures, Mr. Day showed, had been recorded since then by Professor Rankine, Professor Piazzi Smith, and Dr. Robinson, Armagh, the last mentioned of whom had stated that the gusts of one particular storm, which was half a mile in breadth, blew at the rate of 125 miles an hour for six minutes continuously. What would become of the Forth Bridge in such a gale as that? But of course the bridge as at present devised was not going on. He had that from the Board of Trade. The report of the engineers had been set aside, and the strains as yet were still unsettled. As to the pressure on the Tay Bridge on the night when it fell, the wind would, of course, blow with much greater force down the conical valley of the Tay than it would in the open; and, according to Dr. Robinson, nearly one-third would have to be added to its velocity near the bridge, owing to the contraction there of the Firth. Dr. Robinson had also said he had no doubt that the vertical effect of the wind resisted by the water below and by the pressure of the head above would tend to lift up the whole bridge off the piers. On February 20, 1877, a storm was recorded at Holyhead, the gusts of which blew at the rate of 200 miles per hour; and on November 16, of the same year, there was a storm which blew at 180 miles an hour.—*The Architect.*

The First American Iron Works.

In 1652 James and Henry Leonard established the first bloomery in America, at Taunton, Massachusetts. A correspondent of the *Evening Post* says that the Leonard establishment was about two and a half miles from Taunton Center, now Raynham. Henry Leonard, a brother of James, leaving the latter and his son to carry on the business in Taunton, went to New Jersey, and established a bloomery there. He removed to that State because the ore was much more profitable in its yield, and purer.

When the British Parliament prohibited the manufacture of iron in the colony, in 1750, there were three bloomeries at Taunton, carried on by the Leonards, Deans, Kings, and Halls, all akin by intermarriages. They dug their ore in the neighborhood, all along the streams which empty into Taunton River, mostly, however, along "Canoe River," now "Mill River," and also in the bogs of "Two Mile River." It is proper to add that the Parliamentary prohibition did not stop the work.

The first furnace for making pig iron, according to a recent letter to the Philadelphia *Press* from Principio Furnace, Maryland, was set up at that place in 1715, and its account books are preserved dating as far back as 1725. In 1727 the record shows the price of iron to have been £10 a ton. The writer says that it is probable that the first pig-iron ever exported from America to England—a small lot of three and one-half tons in the year 1718—was made at Principio. Prior to the Revolution Maryland and Virginia made and exported more iron than any other of the colonies. In the custom house returns in England the two colonies are always coupled together, because the Maryland iron was first sent to Virginia in small boats to be reshipped to England, and it is therefore impossible to allot to each colony its proper share of iron exported under the fostering care of the proprietary government. The production of iron increased in Maryland until 1751; it, with Virginia, exported to England 2,950 tons of pig-iron against 199 tons from Pensylvania, 33 tons from New York, 9 tons from New England, and 17 tons from Carolina.

In 1761 the eight furnaces and ten forges in Maryland made 2,500 tons of pigs and 600 tons of bar iron, while the annual production of England herself at that period was only 17,000 tons of pig-iron. Some of the ore banks worked by the Principio Company were on the Patapsco River, below the site of the future Baltimore, and were first discovered by that wonderful man, Captain John Smith, in 1606. Augustine and Lawrence, the father and brother of George Washington, were among those who had an interest in the Principio Company, which was retained by the Washington family until after the close of the Revolution.

The Use of Atropine in Cataract.

At a recent meeting of the Société de Biologie in Paris (*L'Union Medicale*, January 17, 1880), M. Javal said that atropine might be useful at the outset of cataract before the necessity for operation was indicated. If it were employed, note must be taken of two conditions. If the opacities be central and well limited, the dilatation of the pupil allowing the entrance of a large amount of light into the eye will produce a marked improvement of vision. As regards the state of the refractive power of the media, atropine, besides dilating the pupil, brings on paralysis of accommodation. The patient will not benefit by the first of these effects, unless the inconveniences of the latter be compensated by the help of correcting glasses, which should be most carefully chosen. By combining the use of these two expedients—atropine and spectacles—a large proportion of the visual difficulties depending on cataract may be diminished.

Artesian Well in Boston.

At present an artesian well is being bored in Boston under the direction of Mr. J. A. Whipple, in order to determine whether or not there is under the city an adequate, available supply of pure water. The experience of the men engaged has been as follows: They first bored through six feet of hard filling; then met with a stratum of some soft black substance in a semi-fluid state, about forty to forty-five feet in thickness. Below this they found from ninety-three to ninety-seven feet of stiff blue clay, overlying a stratum of coarse gravel, in which they found a small stream of excellent pure water. After this they again encountered a twenty foot vein of the stiff blue clay mentioned before, having passed through which they struck a solid bed of hard slate rock or shale, which necessitated the use of the rock drill, which they are using up to the present time. At the depth of three hundred feet they struck a second small stream of good water in the slate rock. They have now reached a depth of about three hundred and seventy-five feet. The tubing they put down measures eight and one-half inches, outside diameter, and is one-fourth of an inch thick. The weight now operating on the rock is about 3,000 pounds, the drill itself weighing about 1,600 pounds.

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IMPROVED GANG PLOW.

The annexed engraving represents a novel gang plow recently patented by Mr. Francis Stanley, of Toronto, Canada, and possessing many improved features, which render it very effective.

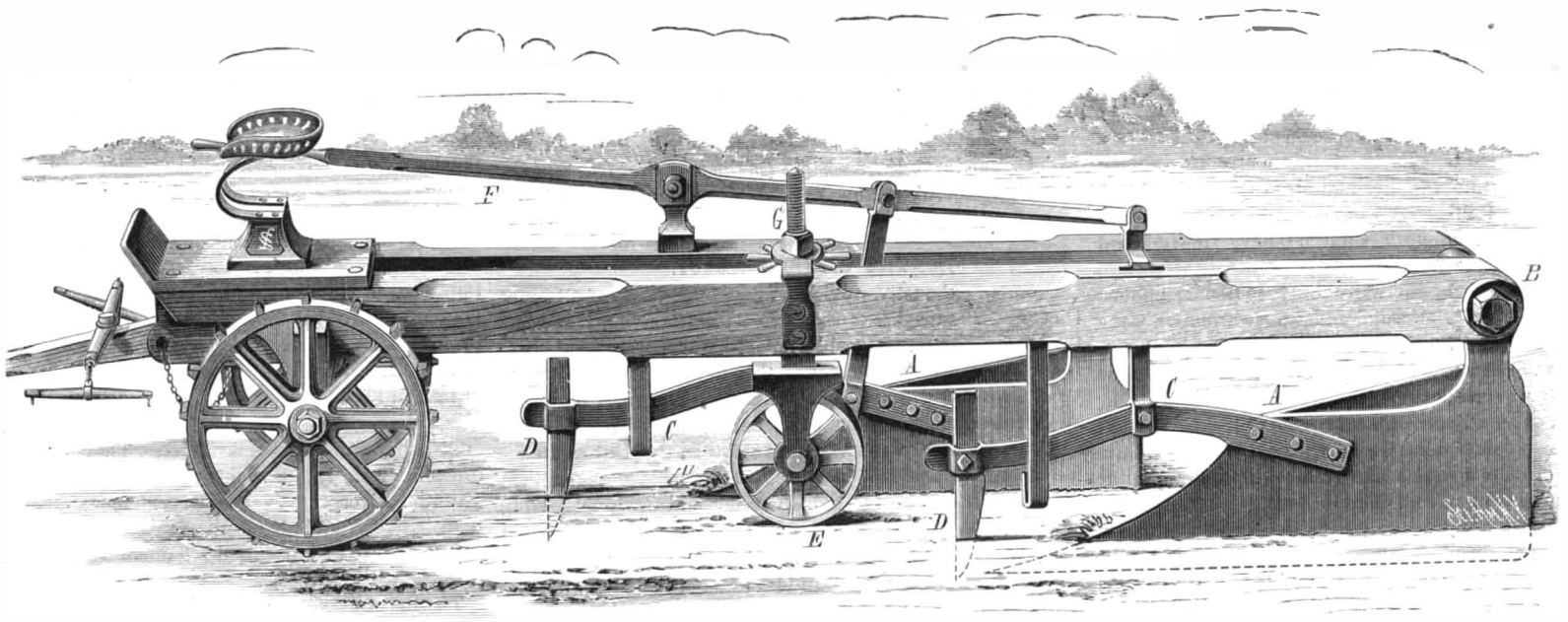
This plow may be readily adjusted so as to cut furrows of different depths, and the plowshares may be raised clear of the ground without detaching any part of the implement.

Two or more plowshares, A, are pivoted to the main frame, as at B, and are provided with arms, C, projecting forward and carrying colters, D. The arms, C, are connected by rods with the lever, F, fulcrumed on the top of the plow frame, and extending to the driver's seat. By means of this lever the plowshares may be easily raised or lowered by the driver without moving from his seat. The forward end of the plow frame is supported by two wheels turning on an axle secured to the frame. The middle of the frame is supported by an adjusting wheel, E, that has a threaded spindle, G, provided with an adjusting nut, by which the distance of the wheel from the main frame may be varied and the shares be consequently raised or lowered. If it is desired to use the plow as a light cultivator, the wheel, E, is removed, and a wheel of peculiar construction is inserted in its place.

The nut on the spindle, G, is then turned so as to raise the plowshares clear of the ground, when the barbed wheel inserted in place of the wheel, E, will act as an efficient cultivator.

The advantages possessed by the plow will be apparent to those familiar with the performance of this class of agricultural implements.

Further information may be obtained by addressing the inventor, Mr. Francis Stanley, care of J. Thompson, 364 Yonge St., Toronto, Canada.



STANLEY'S GANG PLOW.

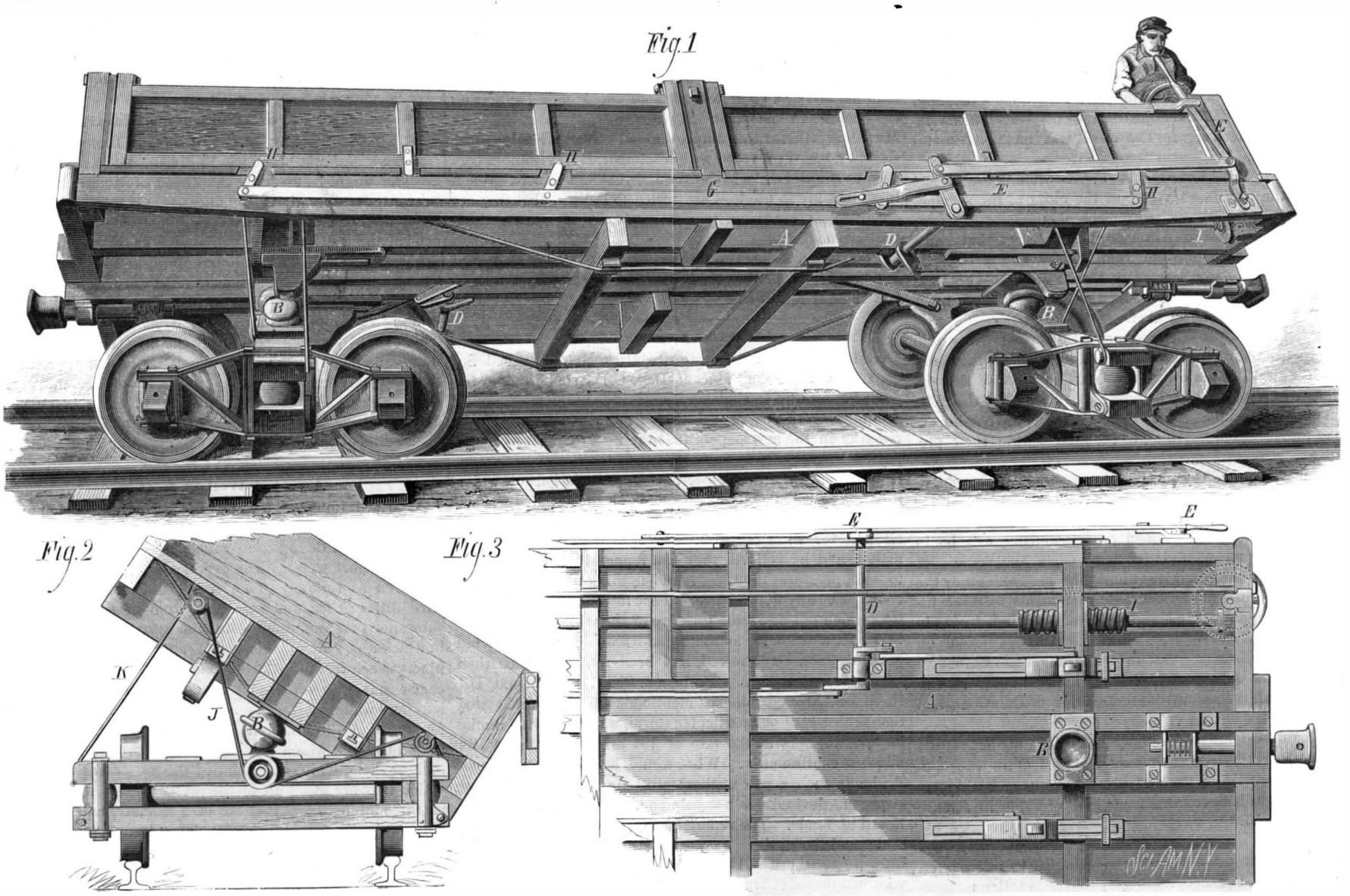
NEW DUMP CAR.

We present herewith engravings of an improved dumping car patented by Mr. Matthew Van Wormer, of Dayton, O., and now being introduced by the New England Car Company, of 48 Congress street, Boston, Mass. This car possesses many points of novelty which are covered by separate patents. It has been improved from time to time until, as it now stands, it appears to fulfill all the requirements. In its construction it is as simple as well can be when all of its functions are considered. It is a full sized gondola car, and capable of running with the same steadiness and security as the ordinary cars of the same size, while at the same time it is as perfectly manageable as a common dumping wagon.

Fig. 1 shows the entire car in perspective while being dumped; Fig. 2 is a vertical transverse section, taken just in front of one of the trucks; and Fig. 3 is an inverted plan view, showing the apparatus for moving the side bearings.

The car body, A, when in its normal position, is supported by ball and socket rockers, B, in the center, and by movable side bearings, C, on opposite sides of the rockers. The movable side bearings, C, are movable lengthwise of the car, and are connected in pairs with the rock shafts, D, so that the simultaneous movement of the two members of the pair on one side of the rockers is effected by the rocking of the shaft. This operation removes the side bearings of one side of the car and puts it in condition to be dumped. Upon the outer end of the rock shaft there is a lever, E, which is connected with the lever, F, at the side of the car near its end. The lever, E, is connected with a bar, G, extending along the side of the car, and pivoted to four or more lever catches, H, which hold the side doors of the car in position to retain the load. By this arrangement of the levers and their connections the car doors may be released and the supports, B, moved, making the car ready to dump. The apparatus for dumping the car is very simple and effective, and capable of holding the car platform at any desired angle. It consists of a long shaft, I, extending along the body of the car, and provided at one end with a worm wheel, which is engaged by a worm on a vertical shaft, extending upward through the platform of the car, and provided with a lever or wheel by which it may be turned.

Upon drums carried by the shaft, I, are two drums, upon each of which are wound two chains, J K. The chain, J, runs downward around a sheave on the truck timber, thence upward over a sheave on the car body, then downward to



THE NEW ENGLAND CAR COMPANY'S DUMP CAR.

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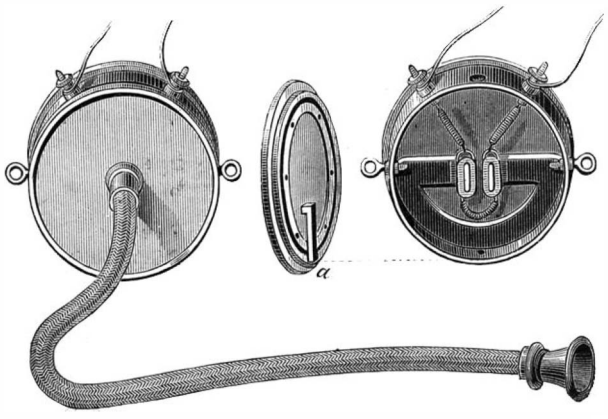
the end of the truck timber, where it is secured. The chain, K, runs directly down to the truck timber. By turning the shaft, I, in one direction the car is dumped on one side of the track, and by turning it in the other direction the load is discharged on the opposite side of the track. This result is secured by winding one of the chains, I J, while the other is unwound. The worm gear affords ample leverage for operating the shaft, I, so that the car may be dumped by one man standing on the platform.

The merits of this dumping car will be understood and appreciated by railroad engineers, superintendents, and managers, who are familiar with the imperfections of the ordinary cars.

Any further information in regard to this invention may be obtained by addressing the New England Car Company, 48 Congress street, Boston, Mass. Mr. Simeon Brownell is general manager and sole agent for the United States.

THE GOWER SYSTEM OF TELEPHONIC COMMUNICATION, PARIS.

At present there are two telephone companies in Paris, one using the Gower telephone, the other the Edison. A third company introduced the Blake transmitter, but was soon consolidated with the Gower Company, who were the first to introduce telephonic communication in Paris. The Gower telephone, of which an exterior view and sections are shown in Figs. 1, 2, and 3 of the annexed engravings, requires no battery, as the currents for transmission of sounds are generated by the instrument, and it is provided with a peculiarly arranged magnet, by means of which a sound resembling that of a trumpet can be produced for signaling. Each subscriber is provided with a telephone connected with the main central office by means of an insulated wire, which is laid underground. A great difficulty is experienced in insulating the wires sufficiently to avoid the effects of induction. When several wires pass in one direction they are united in a cable, and the covering of the wires is of different colors, so that a wire may be traced very readily in case of accidents. At the central office the cable is separated, and each wire is conducted to its special office connection. To better explain the operation of this telephone system we will describe it in action. Each subscriber is known by a certain number. Assuming that No. 5 desires to communi-



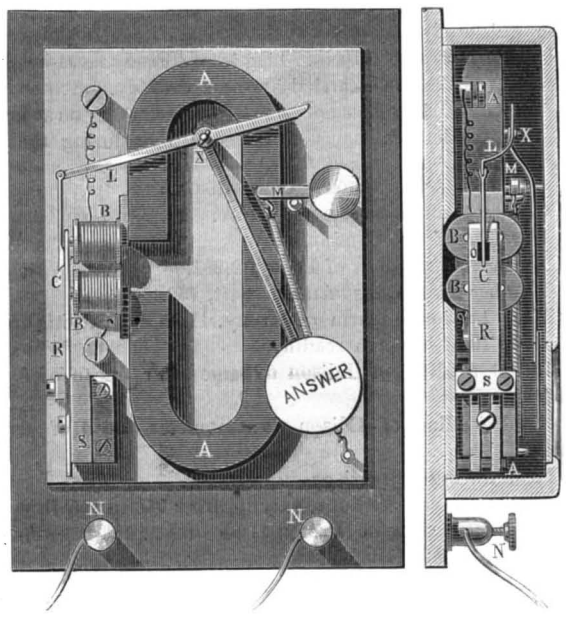
Figs. 1, 2 3.—THE GOWER TELEPHONE.

cate with another subscriber, he gives the signal by blowing into the tube of his telephone.

The Gower Company, desiring to maintain the simplicity of the instrument, have adopted a signaling device invented by Mr. Ader, which answers in every respect. It is illustrated in Figs. 4 and 5. A is the magnet of a telephone, and the subscriber's wire communicates with the bobbins, B B. R is the vibratory tongue, fixed at its lower end. The signal consists of a white disk with the word "Answer" printed on it, and it may also bear the number of the corresponding subscriber. This disk is attached to a pivoted lever, which can be locked in an inclined position, so as to keep the disk out of sight by means of a rod attached to it and terminating in a triangular stud, which passes into a slot in the upper end of the vibratory tongue, R. The signal disk will drop until its lever arm is perpendicular, when released by the vibration of the tongue, R, and it will then be visible through an opening in the box of the apparatus. When the sound signal is given the plate, R, vibrates, and at each vibration the triangular stud, C, will slip out of the slot in the plate a very short distance and finally leave it altogether when the disk shows. The sound signal is required to operate this visible signal, as the vibrations produced by the ordinary speaking are not powerful enough to operate this mechanism.

A call bell is sometimes arranged so as to sound when the disk drops, and it is of great service in case the switchman is not at his post, as it calls attention to the fact that he is wanted. Generally six signaling devices are arranged in one box, as shown in Fig. 7, and the signal box with the call bell is arranged above the switch, as shown in Fig. 8.

The subscribers' wires are arranged in groups of about thirty, those persons communicating with each other very frequently being united in one group. Each switchman has charge of a signal box and switch, represented in Fig. 8, which shows only ten subscribers, whereas there are twenty to thirty or more in each division, as before stated. A box



Figs. 4, 5.—THE SIGNALING APPARATUS.

containing the Ader signals is represented in the upper part of the cut, the white circles, with the numerals above them, representing the small windows or openings through which the disks can be seen when they have dropped. The call bell, which can be brought into action when required by means of a commutator, I, is mounted on top of the signal box. The plug switch, which is arranged below the signal box, consists of a series of vertical bars of metal, one for each subscriber, and a series of horizontal bars of metal arranged behind the vertical bars in such a manner that the two series do not touch each other, but are perforated at the crossings, so that a communication between a vertical and a horizontal bar can be established by passing a plug through the said perforations at the intersection of the bars. Each vertical bar is provided with a pin, and in Fig. 8 all the pins are represented as connecting the vertical bars with the lowest horizontal bar connected with a ground wire. Supposing the subscriber to have given his signal, and thus notified the switchman that he desires to communicate with another subscriber, the switchman takes the plug from the transverse bar and places it into the aperture at the crossing of the bar, No. 5, with the second horizontal bar, and he is now in communication with No. 5, and asks him with whom he desires to communicate. No. 5 replies that he desires to be connected with No. 9. The employe then resets the signal of No. 5, and connects No. 9 with the second bar by means of the plug in the manner described, and is thus in communication with No. 9, and gives the signal, which may be a simple sound

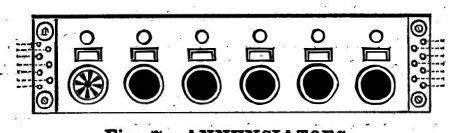


Fig. 7.—ANNUNCIATORS.

signal, the Ader visible signal, or the call bell, as the subscriber may have arranged it at his house or office. No. 9 is then notified that No. 5 wishes to communicate with

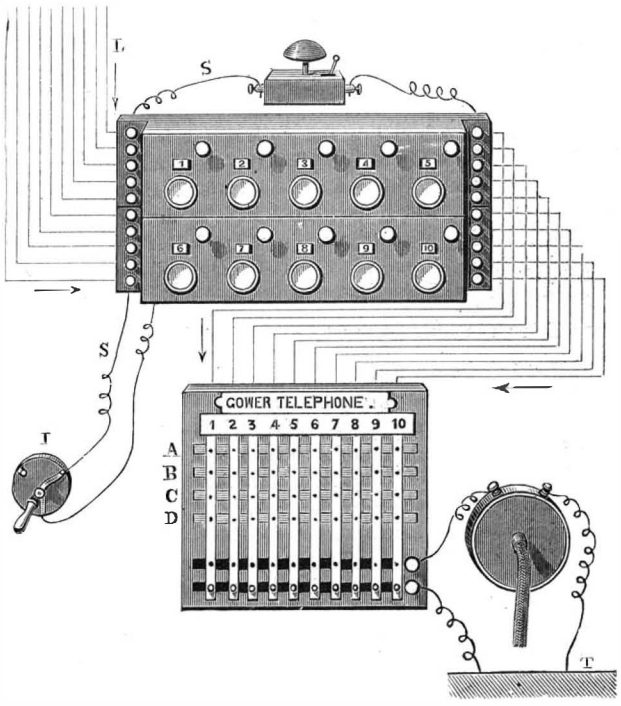


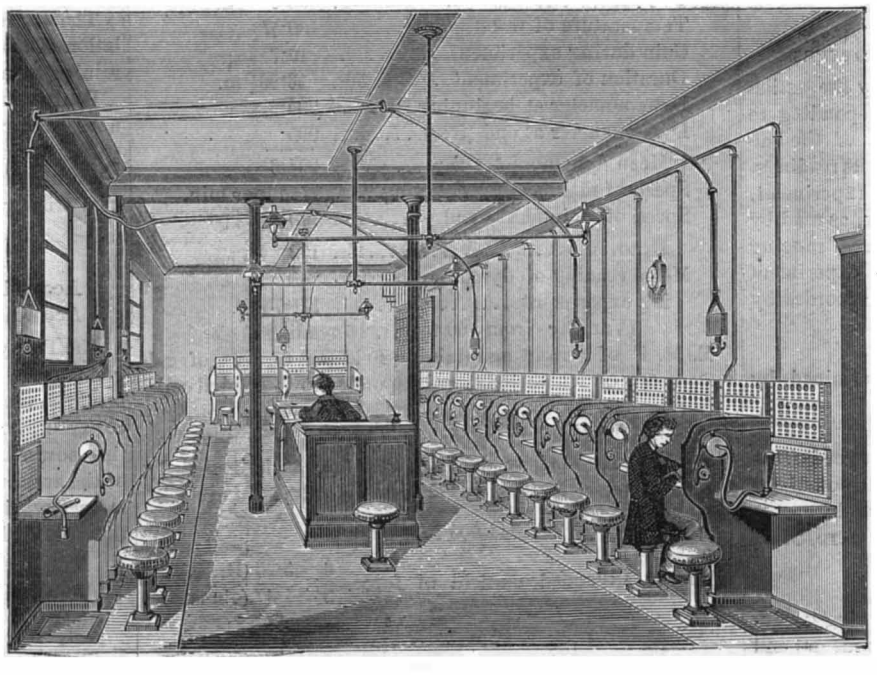
Fig. 8.—ANNUNCIATORS AND SWITCHES.

him, and No. 5 is notified that No. 9 is ready, the pins of the vertical bars, Nos. 5 and 9, having been placed above one and the same transverse bar, for instance, A, Nos. 5 and 9 are connected, and can converse with each other with complete privacy.

It must be stated that the disks of 5 and 9 have been raised, and as soon as their conversation is over Nos. 5 and 9 blow into the tubes of their telephones, thus notifying the switchman, who places the two plugs back in the bar connected with the ground wire. But if No. 3 and 7 wish to communicate at the same time that 5 and 9 are in communication, the pins belonging to 3 and 7 must be passed into the apertures at the intersection of the vertical bars, 3 and 7, with the second transverse bar, B, and in like manner, the next two subscribers are connected by means of the bar, C, and so on. These connections, however, only relate to subscribers of one and the same group or division. If the subscribers belong to separate divisions the connections are a little more complicated. If, for instance, No. 5 notifies the switchman that he desires to converse with No. 83, who is not in his group, which may be designated by A, and comprises the subscribers from 1 to 30, but probably will be found in group, C, comprising the subscribers from 60 to 90, the switchman passes the pin of No. 5 through one of a number of horizontal bars located between the bar, D, and the second bar, not shown in drawings, and then writes on a slip of paper: "The subscriber 5, group A, line 6 (for example), desires to be connected with No. 83, group C," and sends this slip to the group C. The switchman in charge of this group notifies No. 83, and then connects him with the line 6. He then sends the slip to the employe in charge of the grand commutator, where the groups A and C are connected in the line 6, thus permitting No. 5 to converse with 83. As soon as they have completed their conversation they give the signals, and all the pins are replaced into their former position.

In the annexed cut we give an exact representation of the central station, showing the cases of each group arranged along the wall, and the grand commutator which connects 50 lines in the rear.

This system requires no batteries either for calling or transmitting. There are at present one hundred subscribers connected in Paris, and five hundred applications have been received.—*La Lumière Electrique.*



CENTRAL OFFICE.

NEW INVENTIONS.

Messrs. Jacob Waggoner and George E. Waggoner, of Perrin, Mo., have patented an improved harrow so constructed that it may be adjusted wide or narrow, as the work to be done may require.

A simple and effective machine for moulding and pressing bricks has been patented by Mr. James A. Reeder, of Corinth, Miss. The invention consists in combining, with a brick machine plunger, graduated arms to raise and lower it, for the purpose of regulating the quantity of clay that enters the mud box.

A lamp stand or body of separate parts that fit within or over each other and are held together by one bolt, and provided with detachable handles or side ornaments, has been patented by Mr. Joseph Kintz, of West Meriden, Conn.

An improved salt cellar and pepper box, patented by Mr. William C. Beattie, of Taunton, Mass., consists in an ovalbottomed egg-shaped metal box, divided transversely, and having its sections connected detachably with a screw-thread, and having also one end perforated with holes through which the salt or pepper can be sifted, and the other end weighted or slightly flattened, or both, so as to cause the box to set upright.

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AGRICULTURAL INVENTIONS.

Mr. Joseph Amstutz, of Harlan, Ind., has patented an improved rake reel for reapers and mowers, which is so constructed as to raise and straighten fallen, lodged, tangled, and twisted grain and grass, and hold them in proper position while being cut, and thus allow the machine to cut short, tall, lodged, fallen, tangled, and twisted grain and grass with facility and thoroughness, leaving no scattered stalks and leaving grain in good condition for being bound.

Mr. William S. Neal, of Perdue Hill, Ala., has invented a combined cotton chopper and cultivator, so constructed that it may be readily adjusted as the character of the work to be done may require.

An improvement in the class of grain drills or seeders whose drill tubes have detachable points or hoes has been patented by Mr. William H. Wilson, of Xenia, Ohio. The improvement consists in constructing the point or hoe proper with a tubular shank, and in securing it to a drill tube by a wedge.

An improved grain rick frame has been patented by Mr. Cornelius Geiger, of Tarborough, Ga. This invention relates to portable grain supporters, the object of which is to secure small grains from damage when stacked in the straw, especially on bottom lands subject to overflow, and particularly adapted for the use of rice planters.

Correspondence.

The Edison Light

To the Editor of the Scientific American:

With this I send you the report of Profs. Brackett and Young on the efficiency of Mr. Edison's machine for generating electricity.

As undoubtedly comparisons will be drawn between the figures there given and those which have been given by Dr. Hopkinson for the Siemens machine, an analysis of his figures is not out of place. In *Engineering* for May 9, 1879, a full report of the tests of Dr. Hopkinson may be found.

He assumes, in calculating the work which is done in the circuit, that a gravity Daniell's cell has an electromotive force of 1·125 volts, though this form of cell is the weakest of any. In the calculations which the makers of other machines have rated the efficiency of their machines, 1·079 volts has been assumed as the electromotive force of a Daniell's cell. As the work varies with the square of the E. M. F., his figures for work in the current must be multiplied by $\left(\frac{1\cdot079}{1\cdot125}\right)^2 = 0\cdot919$; that is, 91·9 per cent of the work given by his figures should be taken in comparing the Siemens with other machines. I take experiments 9, 10, 11, and 12 as representing very nearly the conditions of practical use. These show, according to his figures, 3·803 erg-tens in the current to 4·161 erg-tens given the machine by the belt, or 91·5 per cent as the efficiency of the machine. Using the correction mentioned, 84 per cent will be the true number. Taking the resistance of the machine as 0·683 ohm, which it would be after running a short time, these experiments show 52 per cent in outside work; that is, of 5·55 horse power given the machine by the belt, 2·89 horse power were effective outside.

Profs. Brackett and Young show 90·7 per cent converted, and 83·9 available outside.

I hope this statement will be sufficient to end the discussion into which I was drawn some time since regarding Mr. Edison's machine. He then claimed that $\frac{9}{10}$ of the power in the current could be made available; now tests show $\frac{1}{18}$ of the energy in current are available.

It is not "childish," then, to make an armature with about one eighth of an ohm resistance, as was claimed by others at the time. Yours,

FRANCIS R. UPTON.

REPORT OF COMPARISON BETWEEN THE PRONY AND EDISON DYNAMOMETERS, AND UPON THE EFFICIENCY OF THE EDISON DYNAMO-ELECTRIC MACHINE, BY PROFS. C. F. BRACKETT AND C. A. YOUNG, OF THE COLLEGE OF NEW JERSEY, PRINCETON, N. J.—EXPERIMENTS MADE APRIL 3, 1880.

FIRST COMPARISON BETWEEN THE DYNAMOMETERS.

The lever arm of the Prony was held down by the action of a spring balance applied at division 12, corresponding to a virtual circumference of 12 feet. The weight of the balance was 5·41 pounds, which is to be added to all its readings. The balance was read by Mr. Upton. After the experiment, the Edison dynamometer, transmitting no work, as read by Prof. Brackett, indicated (the mean of five readings, ranging from 990 to 995) 994·2 pounds. During the experiment the readings were made by Prof. Brackett and recorded by Prof. Young.

Duration of test, 10 minutes.

Number of revolutions of Prony shaft, determined by counter, 5,664.

Number of revolutions of main shaft, 1,880.

Mean indication of Edison dynamometer, deduced from Prof. Brackett's ten readings, varying from 920 pounds at beginning to 935 at end of experiment, 925·7 pounds.

From this, taking the mean reading of the zero, 994·2 pounds, we have $\frac{994\cdot2 - 925\cdot7}{2} = 34\cdot25$ pounds.

Mean tension on Prony arm, 9·011 pounds, varying gradually from 10·91 pounds at beginning to 7·66 pounds at end of experiment, including weight of scale.

Work registered by Prony, 9·011 (lb.) × 12 (ft.) × 5,664 (rev.) = 612,460 ft. lb.

The diameter of main pulley is 38 inches.

The angle between belts of Edison dynamometer is taken at 44°. Assume $K = \left(\pi \times \sec.\ 22° \times \frac{38}{12}\right) = 10\cdot7297$. Then the Edison dynamometer registered K (ft.) × 1880 (rev.) × 34·25 (lb.) = 690,880 ft. lb. That is, the Prony recorded 88·6 per cent of the work carried by the Edison dynamometer.

The comparison does not seem to us satisfactory on account of the considerable change in the conditions during the experiment.

SECOND COMPARISON.

Constants and observers as before.

Duration of test, 4 minutes.

Number revolutions of Prony, 2,281.

Number revolutions of main shaft, 752.

Mean tension on arm of Prony, 11·35 lb., varying from 11.60 to 10·97 in seven readings.

Initial reading of Edison dynamometer (mean of five), 994·2.

Final reading of Edison dynamometer (mean of five), 994·2.

Mean during comparison, 911·57.

(Mean of seven readings, varying from 910 to 915 lb.)

Work according to Prony, 11·35 (lb.) × 12 (ft.) × 2,281 (rev.) = 310,680 ft. lb.

Work according to Edison instrument, K (ft.) × 752 × $\left(\frac{994\cdot2 - 911\cdot57}{2}\right)$ = 333,360 ft. lb.

In this comparison the Prony registers 93·2 per cent of work indicated by the Edison dynamometer.

We regard this test as fairly reliable, the conditions having been very constant, and the outstanding difference of 6·8 per cent being reasonably accounted for by slip of belts and friction of journals between the two dynamometers.

TESTS OF THE EFFICIENCY OF THE DYNAMO-ELECTRIC MACHINE.

During both these tests the thermometer of the calorimeter and the Edison dynamometer were read as often as every minute, and great pains were taken to keep the water thoroughly stirred. The calorimeter was a galvanized iron vessel, 16·42 inches in diameter and 24½ deep.

The wire coil was wound upon a light wooden frame, so constructed as to serve as a very efficient stirrer.

The thermometer was an excellent instrument, by James Green, graduated to fifths of a Fahrenheit degree, each degree being about three-sixteenths of an inch in length.

Prof. Brackett read the dynamometer.

Prof. Young read the thermometer and made the records.

Mr. Upton and others, the speed of the main shaft and the indications of the high resistance galvanometer in the laboratory.

CONSTANTS.

Weight of calorimeter (empty)	22·63 lb.
Heat capacity of same (taking specific heat at 0·112)	2·53 lb.
Weight of wooden frame	5·71 lb.
Heat capacity of frame (s. taken at 0·30)	1·71 water lb.
Weight of wire coil (54¼ turns, each turn weighing 5·84 grammes)	0·70 lb.
Heat capacity of wire (s., 0·10)	0·07 water lb.
Resistance of coil in calorimeter	1·720 ohms.
Resistance of leading wires taken as $\frac{1}{800}$ of coil	0·0057 ohm.
Resistance of wire on revolving armature	0·140 ohm.
Resistance of coil on field magnets,	1·470 ohms.

FIRST TEST.

Total weight of calorimeter with contained water and everything in place	197·5 lb.
Hence from preceding data the heat capacity of whole	172·77 water lb.
Temperature of air	72·2°
Temperature of water at beginning.	63·8°
Temperature of water at end	80·5°
Gain during experiment	16·7°
Duration of experiment...13m. 50s.	13·83⅓ m.
Dynamometer at beginning (free)	994·2
Dynamometer at end (free)	995·
Mean dynamometer zero	994·6
Speed of main shaft, beginning	174 per min.
Speed of main shaft, end	170
Mean	172
Mean reading of dynamometer during experiment	771·75 lb.

(Varying from 760 to 781, 16 readings.)

E. M. F. of current maintaining field was 61 divs. of galvanometer, on which 168 d. corresponded to 16 Daniell cells, *i.e.*, E. M. F. $= \frac{61}{168} \times 16 \times 1\cdot079$ volts.

Energy expended on driving armature, as indicated by dynamometer = K (ft.) × 172 (rev.) × 13·83⅓ (min.) × $\left(\frac{994\cdot6 - 771\cdot75}{2}\right)$ = 2,844,600 foot pounds.

Energy expended on field of force, $\frac{6}{5} \times \frac{45\cdot25\ (\text{ft. lb.})}{1\cdot47\ (\text{ohms})} \times 13\cdot883\ (\text{m.}) \times \left(\frac{61}{168} \times 16 \times 1\cdot079\right)^2$ = 19,634 foot pounds.

Hence, total energy expended, 2,864,234 foot pounds.

Energy Realized.

a. In calorimeter = 772 × 172·77 × 16·7° = 2,227,420 ft. lb.

b. In leading wires $\frac{1}{800}$ of above... 7,425 ft. lb.

c. In armature $\frac{14}{172}$ of calorimeter, 181,302 ft. lb.

Hence,

Total energy realized ... 2,416,147

Total available (*a* + *b*) ... 2,234,845

Hence,

Total efficiency ... 84·5 per cent.

Total available ... 78·2 per cent.

Remarks.

During this test the driving power was about 6¼ horse power; the electromotive force of the field current, 6·27 volts, giving a current through the magnet wires of about 4¼ webers; and the current developed by the machine was about 45 8 webers through a total resistance of 1·866 ohms.

SECOND TEST.

Total weight calorimeter and contents	200·00 lb.
Hence by preceding data, heat capacity =	175·27 water lb.
Temperature of air	71·1° to 71·8°
Initial temperature of water	63·2°
Terminal temperature of water	79·9°
Gain	16·7°
Duration of experiment	9 minutes.
Speed of main shaft, beginning	176 per m.
Speed of main shaft, middle	173 per m.
Speed of main shaft, end	177 per m.
Mean	175·33
Dynamometer reading before exp.,	985
Dynamometer reading after exp.	995
Mean dynamometer zero	990
Mean reading of dynamometer during the experiment (9 readings, between 645 and 666)	656
Electromotive force of field (by high resistance galvanometer) = $\frac{145}{168} \times 16 \times 1\cdot079$ =	14·901 volts.
E. M. F. of dynamo current = $\frac{240}{51} \times 20 \times 1\cdot079$ =	101·55 volts.
E. M. F. of terminals of dynamo; current broken, $\frac{290}{51} \times 20 \times 1\cdot079$ =	122·71 volts.

Energy Expended.

a. In driving armature according to dynamometer, K × 175⅛ (rev.) × 9·0 (m.) × $\frac{990-656}{2}$ = 2,827,550 ft. lb.

b. In maintenance of field of force, $\frac{6}{5} \times 44\cdot25\ (\text{ft. lb.}) \times 9\ (\text{m.}) \times \frac{(14,901)^2}{1\cdot47}$ = 72,180 ft. lb.

Hence,

Total energy expended ... 2,899,730 ft. lb.

Energy Realized.

a. In calorimeter, 772 × 175·27 × 16·7° = 2,259,700 ft. lb.

b. In leading wires $\frac{1}{800}$ of above ... 7·532 ft. lb.

c. In armature $\frac{0\cdot14}{1\cdot72}$ of *a* ... 183·930 ft. lb.

Total energy realized (*a* + *b* + *c*) ... 2,451,162 ft. lb.

Available (outside of machine) (*a* + *b*), 2,267,232 ft. lb.

Hence,

Total efficiency ... 84·5 per cent.

Available efficiency ... 78·2 per cent.

Remarks.

As a check we may compute the total efficiency from the galvanometer reading and the resistance: Energy developed, 44·25 (ft. lb.) × 9 (m.) × 101·55 (volts) × 1,866 (ohms) = 2,200,500 ft. lb.

The discrepancy is fairly explained by the defective insulation of long wires leading to the galvanometer, as it was raining at the time.

During the experiment the driving power was about 9½ horse power, and the current was 57·4 webers (according to galvanometer, 54·4).

Even with this current the spark at the commutator was very trifling.

SUMMARY.

	Total Efficiency.	Available Efficiency.
According to first test	84·5 p. c.	78·2 p. c.
According to second test	84·5 p. c.	78·2 p. c.

The Prony dynamometer is connected to the Edison dynamometer by a belt from the same countershaft, which is also belted to the electric generators. If we should assume the correctness of the Prony, and that the loss in the transmitting power between the Edison dynamometer and the arbor of the armature was only the same as between the two dynamometers, the above numbers would have to be increased in the ratio of 100 to 93·2 (see above), and we should have:

Total efficiency	90·7
Available efficiency	83·9

C. F. BRACKETT,
C. A. YOUNG.

Princeton, N. J., April 10, 1880.

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AMERICAN INDUSTRIES.

[*Continued from first page.*]

also the cutting of the inner lining, which is of coarser and heavier muslin, to hold the starch better, and a collar is styled three, four, five, or six ply according as it has one to four pieces between its outer and inner sides.

From the cutters, the goods go to the room shown in one of the upper views, where the various pieces are "assembled," as it may be called, that is, a sufficient number of pieces of each kind to make two dozen shirts, with the stock necessary for their finishing, are put together in one bundle, ready to give to those who do work outside of the factory, or to send to the stitching room on the premises. All the orders for goods of different kinds and styles have here to be closely looked after to see that the work is started right.

The stitching room, as shown in the view on the left at the bottom of the page, presents no features of especial novelty, except for the great number of sewing machines at work. Great care must be taken to keep the work free from oil, and so preference is given to a machine which will require little lubricating, and at the same time can be run at a high rate of speed. A number of buttonhole machines are employed, but a portion of this work is also done by hand.

Making the folds on the edges of collars and cuffs and the plaits in bosoms is shown in the view at the top, in the center. A machine introduced for this purpose within the past two years has proved very successful. The edges are folded down or the plaits laid by a metal former, when they receive a quick pressure from heated plates, which puts them in the exact position required, and so that they retain the form thus given until the stitching is done. At the right of this picture is seen a representation of the turning room, where the collars, which have been stitched wrong side out, are turned and the seams pressed out. This work is all done by hand.

The view of the packing room, as seen in the middle, explains itself. The pasteboard boxes used are made for the firm by a local factory, where little else is done than supply this demand.

The laundering of the shirts and collars forms a separate department of the business, not shown in our engravings. In the collar laundry about 100 hands are employed, and rather more than that number in the shirt laundry. A good deal of machinery is used in this part of the work, including huge wash wheels, which will take in four to five hundred dozen collars and cuffs at one time; centrifugal wringers, which turn at the rate of a thousand revolutions a minute; immense starch wheels, steam ironers, etc. In addition to the starching done by machinery a large number of "hand starchers" are employed for the collars and cuffs, and the drying is all done by steam heat. The ironing machines consist of various arrangements of heated rollers and revolving drums, which give to the goods a smooth, fine finish, and all the work of washing, drying, starching, and ironing is performed so expeditiously that the laundry work is regularly kept close up to the production of the factory.

The cost of making a shirt runs from $1.50 to $3.50 a dozen, and, low as this price seems, and impossible as it would be for ordinary seamstresses to make a living in this way, there is never any difficulty found in obtaining all the help needed. There are about 300 hands employed in the building, of which 50 are men, but there are some 1,500 names on the pay-roll besides, of those who take out work to do at their homes in the city and for many miles around, so that, where the money thus earned does not go directly to the support of families and individuals, it enables those who are industrious and ambitious to supply themselves with many additional comforts and luxuries which they would not otherwise have. This is exclusive of the hands employed in the laundry work, which would make the total help engaged in shirt and collar making and laundering number fully 2,000.

The present firm was organized in 1865, but the business was established over twenty-eight years ago. The partners are all practically conversant with and take an active part in the work. Their goods are sold only to jobbers: in New York, from No. 87 Franklin street; in Boston, by Whittemore, Cabot & Co.; and in Philadelphia, by W. L. Wetherly.

The Nature of Light and its Action upon the Eye.

At a recent meeting of the Buffalo Microscopical Club, Dr. Lucien Howe presented the subject of the undulations of light and their perceptions by the eye. Brief mention was made of the different theories, accounting for the phenomena of optics previous to the present century. The difficulties of this subject were first solved by Thomas Young, who satisfactorily explained the undulatory theory of light. He showed that what we call light is an impression produced upon the retina by the wave-like motion of the particles of matter. Subsequently the lengths of these waves were measured. It would take 36,918 waves of red light, or 64,631 waves of violet light, placed end to end, to make an inch. From the speed of light, which has been measured, it is proved that at least four hundred and fifty one millions of millions of these minute waves flow into the eye and dash against the retina in each second. Dr. Howe proceeded with a minute description of the microscopical anatomy of the eye, more particularly relating to the "layer of rods and cones." These were stated as being in reality the terminal filaments of the optic nerve. These are shaken or acted on by the waves of light, and it is especially these with which we see.

The Proposed Illinois Ship Canal.

Mr. Daniel C. Jenne, Chief Engineer of the Illinois and Michigan Canal, contributes to the Chicago *Inter-Ocean* the following account of the proposed through water route from the great lakes, at Chicago, to the Mississippi River:

The first division of the project consists in the enlargement of the Illinois and Michigan Canal from Chicago to Joliet. The present canal was built 48 feet wide on the bottom, with side slopes 1 to 1 in earth, making 60 feet surface width at 6 feet deep, or below the low water of Lake Michigan, with a descent on the bottom of one-tenth foot per mile across the Summit level, toward Joliet. It is proposed to make the enlarged canal 144 feet wide on the bottom, side slopes 1 to 1 protected by slope wall in earth, and 160 feet wide at surface at 8 feet deep, or below low water of Lake Michigan, with a descent of two-tenths foot per mile. This will pass 112,321 cubic feet of water per minute, and give a current of 1·06 miles per hour. The average stage of water in Lake Michigan for the last eight years has been about 2 feet higher, which would make the water 10 feet deep, and would pass 158,533 cubic feet per minute, with a current of 1·19 miles per hour.

The canal enters the Desplaines River about one mile and a half north of the main street at Joliet, or nearly opposite the State Penitentiary, and will be about 33 miles long. The work of enlargement consists of about 15,000,000 cubic yards of excavation, including the removal of spoil banks made from the excavation of the present canal, of which there will be about 4,000,000 cubic yards of solid magnesian limestone to be excavated. Three lift-locks will be required at the southern end, one grand lock at Bridgeport or north end, six public road and street drawbridges, and one double railroad drawbridge, and a large water weir at Lockport. The locks are to be 350 feet long between the gates and 75 feet wide, to correspond with those now built on the Illinois River.

The second division extends from one and one-half miles above Joliet to La Salle, about 67 miles, and will consist of the improvement of the Desplaines and Illinois rivers by locks and dams, and an independent short piece of canal around the rapids at Marseilles. It will require the construction of eleven locks, nine dams, the raising of two dams, nine drawbridges, the independent piece of canal above referred to, and other incidental work.

The third division consists in the improvement of the Illinois River from La Salle to Grafton, on the Mississippi River, and was described in my former communication, distance 227 miles. Of this, 90 miles have been finished by the construction of two locks and dams.

COST OF THE WORK.

The estimated cost of the first division, 33 miles, is...	$11,532,932
Estimated cost of the second division, 67 miles, is.....	4,327,879
Estimated cost of the third division, 227 miles, is.....	1,000,000
Total cost to complete 327 miles.....	$16,860,811
There has been expended by the State on locks and dams.....	747,747
There has been expended by the United States on locks and dams.....	62,360
There has been expended by the United States on dredging wing, dams, etc.....	526,000
Amount already expended.....	$1,336,107
Total estimated cost of the entire work.....	$18,196,918

The item of work, quantity, and the estimate of cost on the first and second divisions are from the report of F. C. Doran, Esq., civil engineer, who made a survey of the same in the fall of 1874, under the direction of Colonel J. N. Macomb, Corps of Engineers, United States Army.

According to these estimates the canal, 327 miles long, will cost $55,560 a mile, and will have twelve times the capacity of Erie Canal, which cost about $90,000 a mile. This route opens an inland water communication between the Gulf of Mexico, New Orleans, St. Louis, and other cities of the great West and Southwest, through the city of Chicago, with the city of New York in one direction, and with the cities on the St. Lawrence River and the Gulf of St. Lawrence in another direction, and through both routes and the extremes with the Atlantic Ocean.

The dimensions of the proposed canal are sufficient to admit boats of 2,500 to 2,800 tons burden, being 80,000 to 85,000 bushels of grain, or one and a half to one and eight-tenths million feet of pine lumber; or fleets of smaller boats can pass the locks at the same time with about the same tonnage, or twelve of the boats of the Erie Canal, or the Illinois and Michigan Canal, can pass the locks at one lockage.

The summit level of the canal could be reduced to 100 feet on the bottom with the same slopes and declivity, and construct basins at every mile 500 feet long and 50 feet wide for boats to pass, and reduce the cost of the first division about $4,000,000, and these at 10 feet deep would pass over 100,000 cubic feet of water per minute.

The Railway up Vesuvius.

The station is situated on a level spot on thewest side of the mountain, about half an hour's walk from the observatory. The constructors of the railway have adopted the American double iron rope system. There are two lines of rails, each provided with a carriage divided into two compartments and capable of holding six persons. While one carriage goes up the other comes down, thus establishing a counterpoise, which considerably economizes the steam of the stationary traction engine. The incline is extremely steep, commencing at 40°, increasing to 63°, and continuing at 50° to the summit. Every possible precaution has been taken against accident, and the railway itself is protected against possible flows of lava by an enormous wall. The ascent will be made in eight to ten minutes, while before it required from one to two hours. To obtain the necessary supply of water, large covered cisterns have been constructed, which in winter will be filled with the snow that often falls heavily on Vesuvius. This snow will be quickly melted by the internal heat, and, besides the water thus obtained, the frequent rainfall will also be conducted into the cisterns.

MISCELLANEOUS INVENTIONS.

Mr. Oscar Kleinberger, of New York City, has patented an improved material for suspender straps or ends. It is made of duck, muslin, or other woven fabric, faced with oil cloth, the two being attached together, with or without a filler, in a solid compact sheet, from which the ends and other portions are afterward cut.

An improved apparatus for flooding oil wells has been patented by Mr. Henry R. Davis, of Pioneer, Pa. The object of this invention is to continuously flood or lubricate oil wells other than flowing oil wells with oil, to prevent the accumulation on their sides of incrustations of salt, lime, paraffine, or other oil deposits.

A portable lantern combined with clockwork mechanism, by which flashing or other signals may be given, so that the number of the signals may convey the desired meaning, has been patented by Mr. Romeo W. Lewis, of Sacramento, Cal.

Mr. William H. Maxey, of Homer, La., has patented a tether for securing horses and other stock while grazing, so constructed as to prevent the animals from twisting the tethers or becoming entangled in them, and also to limit the grazing area without moving the tether.

Mr. John K. Hogan, of Placerville, Cal., has patented a machine intended for splitting peaches and other fruits in halves and removing the stones in preparing the fruit for preserving, and is especially adapted for the varieties of peaches known as "cling-stones," which are generally preserved whole on account of the difficulty experienced in freeing the stones by hand.

Messrs. Lewis B. White and Leonard Henderson, of Middleburg, N. C., have patented a smoke and dust arrester for railway cars, which consists in inclosing the trucks of the cars in a housing having doors at the ends, which housings communicate with a pipe extending through the entire train, through which the air and dust from the wheels is drawn by a fan located in the rear car. Smoke may be drawn from a hood located above the smoke stack of the locomotive by the same pipe.

Messrs. Henry P. Gray and William Gray, Jr., of South Manchester, Conn., have patented an improved apparatus for dyeing and washing yarn, cloth, etc., adapted for use in connection with any desired number of vats.

An improved device for fastening an umbrella to the body of a person who is exposed to the rays of the sun during his work, has been patented by Mr. Thomas Mora, of Franklin, La. The invention consists of a tubular socket provided with side springs and of a tube provided with a laterally projecting ring, both of which are buttoned or otherwise fastened to straps or bands that buckle about the body.

An improvement in heating stoves, patented by Mr. John P. Oeth, of Canton, Mo., is designed to increase the heating surface of stoves, to prevent accidental contact of the body or clothing with the heated surface of the stove, and to enhance the appearance of the stove.

Mr. Hubert Child, of Wichita, Kan., has invented improvements in transparent signs. It consists in "cutting in" a transparent letter on glass by means of an opaque color, and placing behind the glass a packing of broken glass contained between two independent panes of glass, so that when the light from the rear shines through the transparent letter the plane character of said letter is broken up and diversified by the crystals of glass, which may be of different colors to produce a very brilliant and tasteful design.

Mr. William H. Burk, of Greencastle, Ind., has recently patented an ornamental and attractive apparatus for roasting and warming peanuts.

Mr. David N. Smith, of San Bernardino, Cal., has patented improvements in the construction of safes for receiving vegetables, food, clothing, and other similar articles, the object of the invention being to prevent the access of insects to the articles placed within the safe.

An improvement in crates for carrying fruits, eggs, and other perishable articles, has been patented Mr. George E. Bender, of Everett, Pa. The object of the invention is to provide a crate that is perfectly ventilated, and at the same time is arranged to exclude the cold and protect the contents against injury from the outside.

Mr. Edward Barnard, of Rome, N. Y., has patented a quarter boot for horses, having a soft leather body with stiff pads on the quarters, and a stiffening sole strip, the whole adapted to be held in place by straps and buckles.

An improvement in gate latches, patented by Mr. Samuel B. Elzey, of Atlanta, Ga., consists in combining a pivoted latch carrying an arm, a sliding bar carrying an arm, and a spindle carrying an arm, so that the gate may be unlatched by turning the spindle.

Mr. William Linehan, of Chicago, Ill., has patented a device for automatically feeding the fluid for preventing incrustation into the boiler along with the feed water, when supplied by a pump or an injector. It consists of a reservoir for holding the fluid, from the bottom of which a siphon pipe leads to the pump barrel or injector at a point where the water is forced or drawn by suction into the boiler. The siphon pipe is supplied with a stopcock and check valve, to regulate the amount supplied and to prevent back pressure when pumping.

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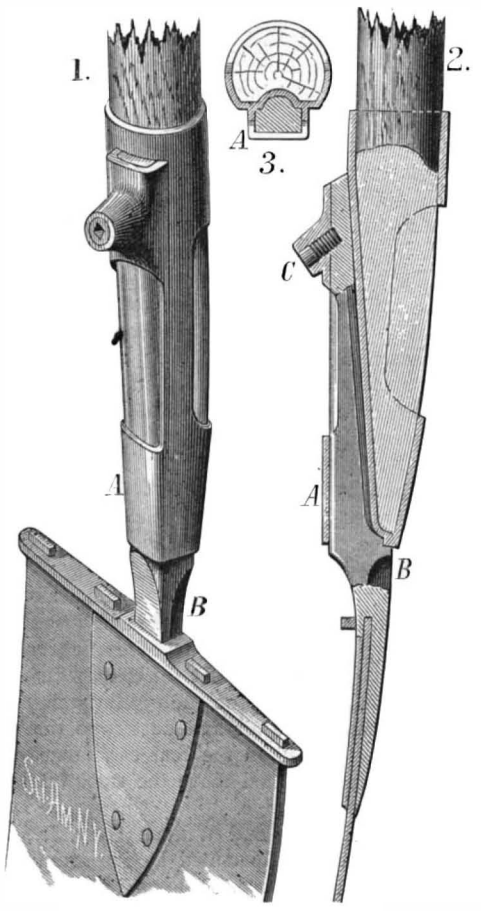
NOVEL TOOL HANDLE.

The annexed engraving shows an improvement in the class of tool sockets designed for application to wooden handles, and adapted for holding tools of various kinds, such as shovels, forks, spades, and other agricultural hand tools.

The socket is fitted to the lower end of the wooden handle, and has in its upper face a concave depression or groove for receiving the shank, B, of the shovel, spade, or other implement, in connection with which the handle is used. Over the groove in the socket there is at the upper end a keeper or loop, provided with a set screw, C, for holding the shank, and at the lower end of the socket there is a keeper or loop, A, that holds the larger part of the tool shank. The



IMPROVED TOOL HANDLE.

set screw is inclined at an angle to the shank, so that its tendency when tightened will be to draw the shank into the handle.

This handle may be readily applied to any tool having a shank adapted to it by simply inserting the shank and tightening the set screw.

This useful invention was recently patented by Messrs. J. H. Richardson and J. C. Calhoun, of Oakley, La., who may be addressed for further information.

NEW ROTARY ENGINE.

The annexed engraving represents an improved rotary engine recently patented by Mr. William N. De Groat, of Knoxville, Tenn., the patent being now owned by Messrs. W. N. De Groat and A. L. Maxwell, of same place.

The engine is shown in perspective in Fig. 1 and in section in Fig. 2. The revolving pistons are secured to a rotary disk, work in a stationary annular cylinder having three sliding abutments, C, which are operated at the proper instant by a cam, A, on the main shaft through a system of levers, B, and suitable connections. Steam and exhaust ports enter the disk at or near the center, and pass to its periphery in opposite directions, the steam supply port communicating with the cylinder through one face of the piston-head, and the exhaust port running through the opposite face. The exhaust ports are arranged so that the sliding abutments are relieved of steam pressure before it is moved, and it is restored to its place under a pressure which is balanced with the exception of the small area of the stem by which it is worked.

For convenience in reversing the engine there are steam ports on opposite sides of the piston, and a plug valve, D, in the disk is employed to change the direction of the steam supply and exhaust and thus reverse the engine. Steam is exhausted from the engine through the passage, *a*, and admitted through the central passage, *b*.

This engine has no dead points, and always works to its full power throughout its entire revolution. The inventor claims an advantage admitting and exhausting steam from the face of the piston, as the steam is not wiredrawn by passing through tortuous passages.

It is obvious that this engine requires no flywheel, as the motion is continuous, and not intermittent as in the case of reciprocating engines, and a great advantage in economy of steam is claimed, the power being applied directly and in the right place.

For marine engines the rotary form has many advantages that will be understood and appreciated by engineers. A study of the engraving, in connection with what has already been said, will be sufficient to make clear the construction and merits of this engine.

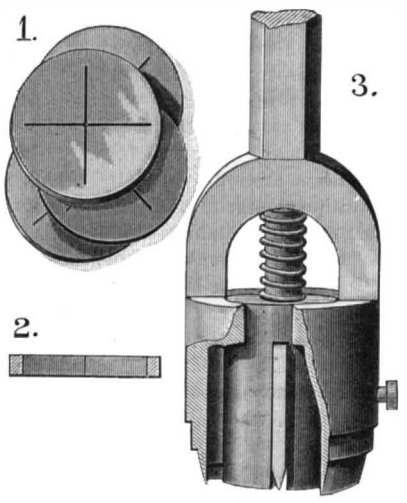
MECHANICAL INVENTIONS.

An improved device for use upon steam railroad cars, street railroad cars, at stations, and in other places, to indicate the name of the next station, street crossing, or other stopping place, the distance to it, and the time when due, and also, when used at stations, to indicate the next train and the time of departure or arrival, has been patented by Messrs. John B. Herbert and Charles Layton, of Old Bridge, N. J.

An improved pitman connection has been patented by William F. Rundell, of Genoa, N. Y. The invention consists in a wrist pin made of two diameters, a box having tangs or shanks to be bolted to the pitman, which box is arranged to bear in the plane of the larger diameter of the wrist pin, the pitman being prevented from slipping off by a flange on the inner sides of the box extending down to and fitting the smaller diameter of the wrist pin, while a gasket and circular plate on the outside is screwed to the box to inclose the wrist pin and make an oil-tight bearing.

IMPROVED GUN WAD.

The annexed engraving represents a gun wad specially adapted for loading and discharging shot from a fowling-piece. Gun wads have been made of concavo-convex form in such a manner that when pushed into a gun barrel or cartridge shell by means of the square end of a ramrod or plunger they would expand under pressure to fit tightly upon the charge. Flat wads have also had their edges or perimeters scalloped or pinked, so that a wad larger than the bore of the gun or cartridge could be readily crowded in upon the charge, to be retained by the elasticity of the compressed serrated or pinked edge of the wad. In both instances the wad leaves the gun intact and impedes the flight of the shot and affects their direction and force. The invention shown in the engraving is intended to compress and pack a wad tightly upon a charge of shot in a gun barrel or cartridge shell, in such a way that it will remain intact until moved by the explosive force of the powder, when it will



NEIMEYER'S GUN WAD AND PUNCH.

open in its center and sever into quarter sections, and allow the charge of shot to virtually fly through the wad without being impeded or misdirected by the fragments of the wad. This is accomplished by forming a crosscut or a series of radial incisions in a wad by means of the combined hollow punch and a solid four-bladed cutter, shown in Fig. 1.

The wad is intended to be used only over the shot, and when the gun is discharged the parts of the wad will be found upon the ground from five to six feet ahead of the muzzle of the gun. By the use of this wad no obstruction to the direction or force of the shot is offered, and the pattern is thereby improved and the penetration increased.

Further information may be obtained by addressing Mr. Jacob Neimeyer, Atlantic, Ia.

Fig. 1

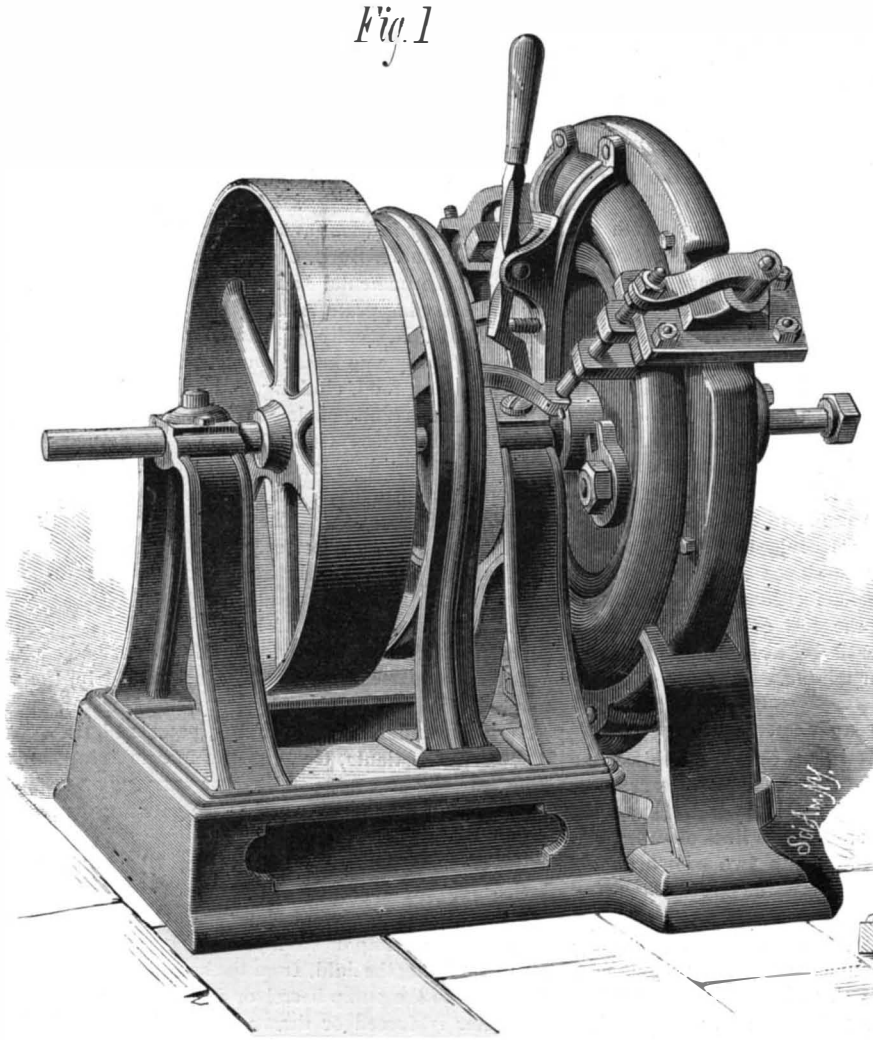
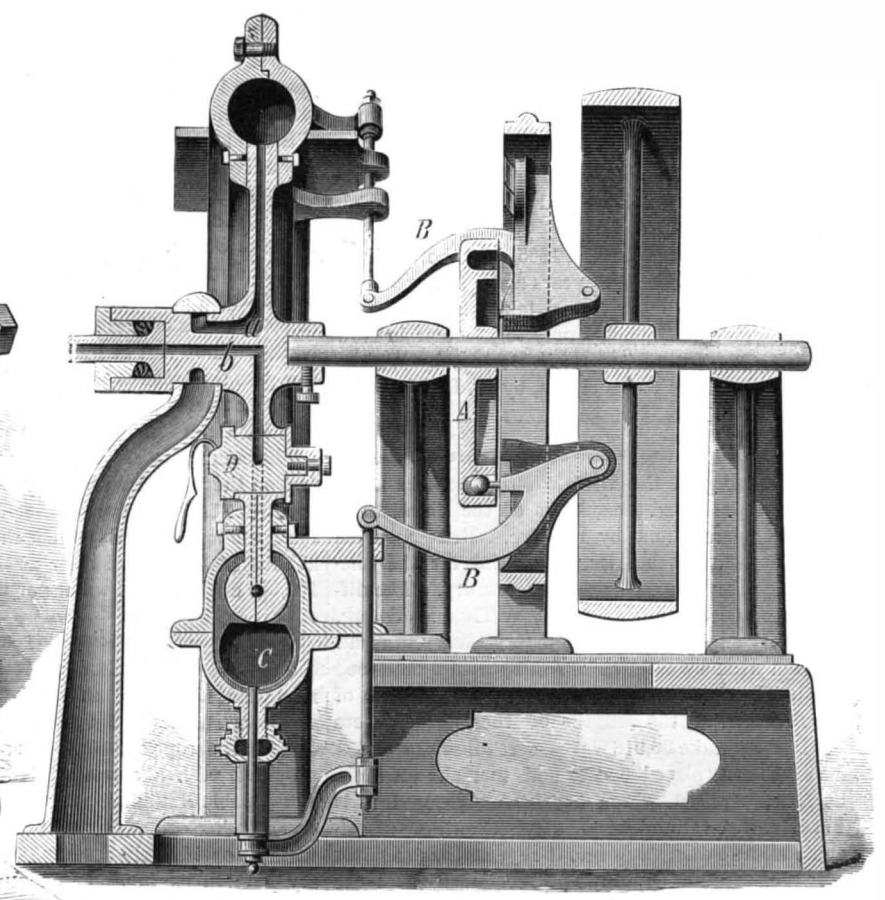


Fig. 2



DE GROAT'S ROTARY ENGINE.

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A CHAPTER ON TROUT.

BY DANIEL C. BEARD.

Brook trout are always associated in my mind with delightful scenery, clear, swift running water, and bracing air, and I am sometimes tempted to think that it is the association that lends such a delicate flavor to their meat. As Aldrovandus quaintly expresses it, "The salmon, the grayling, and the trout, and all fish that live in clear and sharp streams, are made by their mother nature of such exact shape and pleasant colors purposely to wite us to joy and contentedness in feasting with her." St. Ambrose of old called the grayling the "flower fish." While making a drawing of the *Thymallus Americanus* at Fulton Market, Mr. Seth Green said: "Can you paint the rainbow? If not, do not attempt to reproduce the beautiful tints that glisten and flash upon the dorsal fin of the grayling." Not being able to "paint the bow upon the bended heavens," I was compelled to content myself with black and white, hoping at least to give some idea of the shape and form of this and other graceful and odd fish exhibited at the opening of the trout season by Mr. Eugene Blackford at his place in Fulton Market.

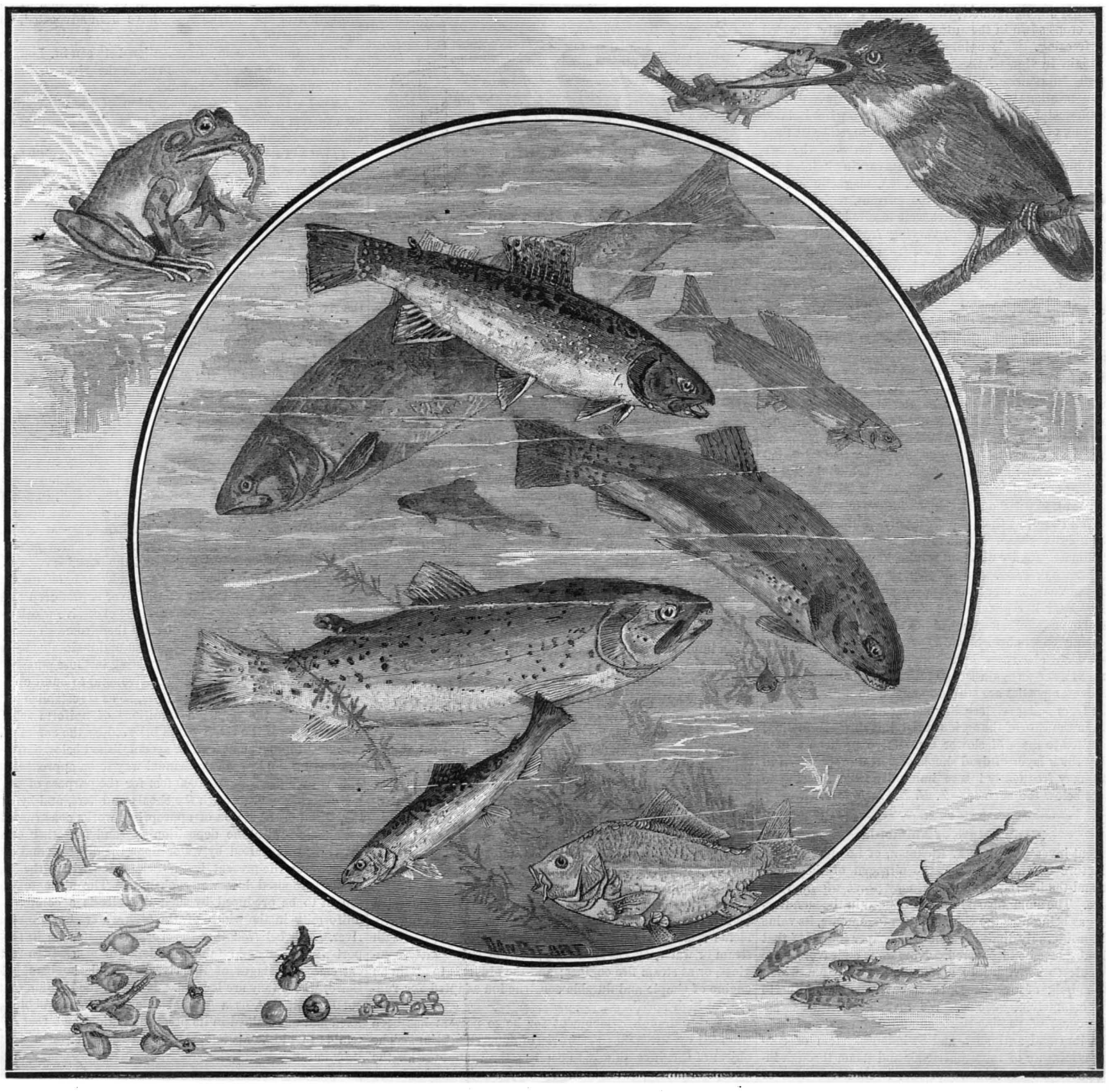
With the energy and goaheaditiveness for which Mr. Blackford is noted, he collected for the inspection of the pisciculturist, naturalist, and angler, all the procurable varieties of trout specimens of the *Salvelinus fontinalis* from England, Scotland, Ireland, France, Germany, Canada, Maine, New Hampshire, New York, Long Island, New Jersey, Wisconsin, Pennsylvania, Illinois, California, Maryland, Utah, and Colorado. There could also be seen trout from all the leading fish-culturists and fish commissioners of the United States, eggs and live trout, from those who just escaped the egg with the abdominal sac still attached, to the full grown fish disporting themselves in glass jars and tanks of crystal waters.

The first fish laid before me was a male trout from Shaster County, California, sent by B. B. Redding, Commissioner of Fisheries, measuring a little over two feet in length and weighing five and three-quarter pounds, well shaped and plump; on its body a paucity of red spots, but large black dots are sprinkled thickly upon the shoulders and tail; the operculum is decorated with a bright red tint, vanishing or blending into a greenish brown or olive toward the eye. A broad red dash of color extending from tip of tail to cheek gives this fish a very gaudy appearance. "Here," said Mr. Blackford, "is a remarkable fellow from the hatching house, McCloud River, California. It is called the 'Dolly Varden.'" And he placed before me a five and a half pound trout, round and dumpy, large odd head, an abnormal adipose fin, the other fins and tail short. In the place of the usual markings of his family, this fish was covered with large red semi-annular blotches. A slit cut in its back by Mr. Seth Green showed the flesh to be a rich salmon color. After making a careful drawing of this odd Western trout, Mr. Green placed before me an interesting hybrid, a cross between the California salmon and the common brook trout of New York. It was two years old when killed, and measured nine and a half inches in length, of a bluish slate color, no red, but a few yellow dots sprinkled sparsely along each side of the lateral line; a rather small head and graceful body, it partook of the nature of both its parents, with a strong leaning to the brook trout. Another three year old hybrid, measuring fourteen inches, looked more like a salmon.

The *S. fontinalis*, from France, is a well shaped fish, the one drawn measuring fourteen inches in length. A few red spots dot the space between the dorsal fin and the tail; dark spots commence at the gills and scatter over the space above the lateral line on its side and back to the caudal fin. Hon. Thomas Clapham sent some very graceful dark colored trout, averaging about twelve inches in length and two and a half inches in width at the dorsal fin. Hugh McGovern's trout were very like Clapham's, but lighter in color. The fish from the South Side Club, Oakdale, are much lighter in color, broader, and prettily marked. The specimen given me to sketch measured eleven inches in length and three and one-eighth inches greatest width. The silvery sheen of its abdomen contrasted strikingly with the carmine hue of the abdomen of some of the wild trout from Canada. It would be an interminable task to mention, much less describe, all the fish that lay upon the marble slabs or swam in the aquariums. Says Isaak Walton: "I am certain if I catch a trout in one meadow he shall be white and faint, and as certainly if I catch a trout in the next meadow he shall be strong and red and lusty," and such is the case. Even the same trout that is light colored upon a white pebbly bottom will, chameleon-like, change to a duskier hue if he swim over a dark mud bank.

At the bottom of the group of fish in the illustration is a picture of the German carp (*Cyprinus carpio*) sent to Mr. Blackford by the Smithsonian Institution. This fish will live in almost any half stagnant pond, and it is proposed to introduce it largely into this country. I have also drawn the portraits of a few of the marauders that pillage the fish ponds. It is wonderful, amid so many mortal foes, that a wild trout ever reaches maturity, but once gaining that age he revenges himself by feeding upon many of his former tyrants. Frogs, toads, lizards, aquatic insects, beetles and bugs, land rats, water rats, mice, minks, wild and tame ducks and geese, heron, and even cats never miss an opportunity and are ever upon the alert for a chance to devour the young trout or ova. Man lends a helping hand in this wholesale slaughter by turning the refuse of saw and paper mills and tanneries or other deleterious material into the streams. However, the sensible laws being enacted and enforced, and the efforts of a few enterprising men, will go far to counteract the mischief done.

The engineer of the Baltimore and Ohio Railroad who transported young black bass in the water tank of his engine and restocked barren streams, furnishes a noble example.



EXHIBITION OF FISH AT THE OPENING OF THE TROUT SEASON.

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White Fish under the Microscope.

At a recent meeting of the Griffith Club of Microscopy (Detroit), Mr. J. C. Holmes, assisted by D. J. McGuire, M.D., gave a demonstration of the circulation of blood, illustrated by young whitefish from the Detroit "hatchery." The young fish, less than a week old, and looking not unlike a pair of eyes propelled about by an exceedingly active tail, were found, under the microscope, to be possessed of all necessary "interior" arrangements. As they are nearly as transparent as glass, the action of the heart in receiving and propelling blood, and the stream of blood corpuscles down one side to the tail, and back on the other, could be distinctly seen and examined.

The whitefish that are caught for this market are largely made to recognize their obligation to posterity, by passing through the "hatchery," where the *modus operandi*, as described by Mr. Holmes, is as follows: The eggs are stripped from the females by pressing the sides with the hands, and deposited in a large tin pan partly filled with cold water. Into this are placed two or three drops of milt, which is obtained by a similar process from one of the male fishes, and which contains the male principle of life—the microscopical spermatozoa. Each drop of the milt contains several thousands of these minute organisms, that would remain undeveloped but for the favorable conditions found in the female egg. These spermatozoa penetrate the eggs, and curling themselves up comfortably await the necessary five months to incubate. It is now the hatching season, and the unhatched eggs resemble a small pea, of a nearly transparent color, but with two distinct black dots on one side, which the microscope shows to be the eyes of the fish.

Temperature of the Soil during Winter.

The French physicists, Edmond and Henry Becquerel, took advantage of the intense cold prevailing at Paris last December, to study the changes in temperature below the surface of the soil under various conditions. It is a widely spread belief among farmers, that when protected by a layer of snow, crops sown in the autumn are effectually guarded against freezing. This opinion, however, must lose much of its weight in view of these late observations, which we will briefly summarize.

The observations were made by means of Becquerel's electric thermometer, which consists simply of two wires isolated by a coating of gutta percha, and soldered together at their extremities. Differences in temperature between the two places of junction cause electric currents varying in intensity with the greatness of the difference. A magnetic needle, brought under the influence of the current, registers on a dial these differences. The wires were inserted in the Jardin des Plantes at various depths, varying from 5 to 60 centimeters, and observations were made from November 26 to the close of December. Frost first appeared in the garden November 26. December 3 snow fell in abundance, and the temperature of the air sank to —11° C. The layer of snow was 25 centimeters deep. December 10, the temperature had sunk to —21°, and commenced then gradually to rise. December 15, the snow was 19 centimeters in depth.

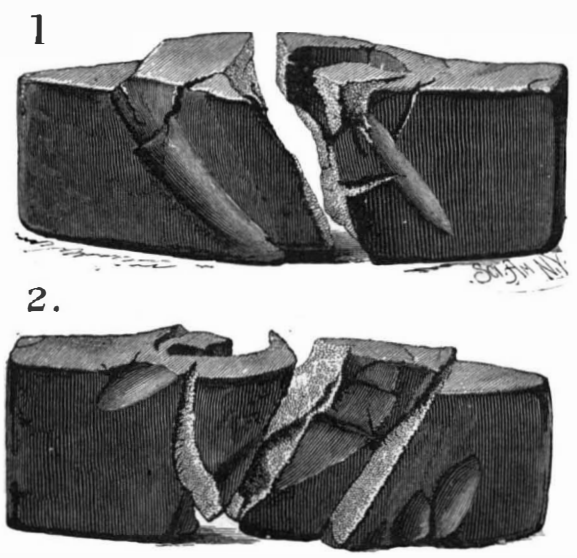
Coming now to the observations made below the surface of the ground under the above circumstances, we find at once a striking difference between the results obtained in soil covered with grass and those obtained below a bare surface of the ground. In soil protected by grass, before as well as after the snowfall, at all depths below that of 5 centimeters, the temperature never descended below 0° C. Registering 3·5° at the depth of 5 centimeters on November 26, it slowly sank to 0·18° on December 14. The presence of grass would appear, then, to effectually protect the earth beneath it from freezing at the lowest temperatures attained in our climate. Quite different results, however, are yielded in the absence of grass. In this case, at a depth of 5 centimeters, the thermometer sank below zero on November 27. Two days later it registered —2·6°. On December 3, just before the snowfall, it reached its minimum of —3·17°. After being covered with snow it registered —0·8°, and later —1·4°. The snow here appears to act in a certain measure as a screen against changes in temperature, but its conductive properties are still too marked to prevent these changes from being felt sensibly at a certain depth in the earth. In the case of the agriculturist, this slow conduction, when united to the still slower conductive properties of a tolerably thick layer of dead shoots of cereal crops sown in autumn, may frequently insure immunity from freezing to the roots below the surface.—*T. H. N., in Nature.*

Manufacture of Ammonia.

A recent invention of J. P. Rickman, of London, for the manufacture of ammonia from the nitrogen of the atmosphere and the hydrogen of steam, may prove of some importance. The ammoniacal liquor produced in the manufacture of gas being now the chief source of ammonia, its value would considerably diminish should a cheaper source of that useful substance be discovered. Numerous endeavors have been made to convert into ammonia the nitrogen which forms the bulk of our atmosphere; but none have hitherto been a commercial success. We may mention Maxwell-Lyte's process of passing nitrogen and steam over an alloy of potassium and antimony, and Swindell's system of conducting a mixture of atmospheric air and steam through incandescent coke. Rickman's process is similar to that of Swindell. A series of inclined retorts are filled with coke and heated to 550° C. A mixture of twelve parts by volume of steam and five parts of atmospheric air is then introduced, and ammonia is formed and afterwards condensed in water. The most important point in working this apparatus is to maintain uniformity of temperature. Should the apparatus be too cool, no ammonia is formed; if the heat be too great, any ammonia which may have been produced is dissociated, and again resolved into the elements to which it owed its origin. This regulation of temperature was found to be so difficult to attain that an improvement has been devised which promises to overcome the chief obstacle to the successful working of the process. It is well known that chloride of ammonium is less easily decomposed at a high temperature than ammonia alone. Mr. Rickman, therefore, converts the ammonia into chloride of ammonium at the moment it is generated, which is effected by mixing common salt with the coal or coke used. It is claimed that by these very simple means ammonia can be produced at less than 1*d.* per pound.

Novel Test for Stone and Ore Breakers.

The annexed engravings are perfect representations of opposite sides of a hardened steel stone hammer which accidentally fell into the jaws of one of Marsden's improved stone and ore crushers manufactured at the Farrel Foundry and Machine Company's Works, at Ansonia, Conn., and doing work at South Easton, Mass.



Hammer Crushed by a Stone and Ore Breaker.

This machine has positive motions and is constructed without springs or cushions to modify the action of the jaws. Nothing could exhibit the prodigious strength of this machine or its immense crushing power better than the sample of work presented in the engraving.

The hammer is of cast steel, hardened and tempered. It is eight inches long, three inches wide, two and a quarter inches thick, and weighs ten pounds.

The fractures and indentations in this solid piece of steel were made without the least injury to the machine.

ENGINEERING INVENTIONS.

Mr. John R. Jones, of Clarksville, Ia., has patented an improved railway car brake, the object of which is to give to the engineer of a train full control of the brakes without interfering with their operation by hand on each car. The invention consists in a pronged lever hung at each end of each car, the levers on each car being connected together and to the brake chains, and the levers being fitted for continuous contact throughout the train, so that when the brakes are applied on the tender by power from the engine there is a continuous or successive application of the brakes from the first to the rear car.

An improvement in governors, patented by Mr. William E. Crane, of Waterbury, Conn., consists in reciprocating a slide valve to regulate the supply of steam and the speed of machinery by connecting a pinion between two straight racks directly with the sleeve of the governor mechanism so as to raise and lower the pinion.

Mr. James N. Winn, of Darien, Ga., has invented an improvement in car couplings, so constructed that they may be readily adjusted to couple cars of different heights, that they will couple the cars automatically as they are run together, and will be readily uncoupled.

Mr. Allen A. Munson, of La Grange, Mich., has invented a combined elevator and carrier for unloading hay and depositing it in the mow, for loading and unloading vessels aud cars, and for other uses.

Some improvements in steam engines have been patented by Mr. Samuel N. Silver, of Auburn, Me. These improvements relate to engines and pumps adapted for use with steam or water, and as stationary, marine, or locomotive engines, or as steam fire engines; and the object is to attain an engine of simple and durable construction adapted for running at high speed.

A spring draught attachment for horse powers has been patented by Mr. Asher E. Morris, of Janesville, Minn. The object of this invention is to connect the draught with the sweeps of horse powers in such a way that both the teams and the machines will be protected from jerk or strain should there be a sudden application of power.

The Mississippi River Commission.

The commission of engineers appointed to investigate the subject of levels and improvements along the Mississippi have submitted their reports.

The thirty-three navigable rivers of the Mississippi system comprise 14,000 miles of navigable waters, intersecting or bordering on eighteen States and two Territories. The extent of territory subject to overflow was, in 1874, estimated to be 41,193 square miles, an area as great as the combined areas of New Hampshire, Vermont, Massachusetts, Rhode Island, and New Jersey, and much more productive under proper conditions. Up to the year 1878 Congress had made for the improvement of the Mississippi river and its various tributaries about two hundred appropriations, amounting in all to the sum of $18,500,000.

The commission consists of Brevet General Q. A. Gillmore, president; Major Charles R. Suter, United States Engineers; Brevet Brigadier General C. B. Comstock, United States Engineers; Professor Henry Mitchell, of the Coast Survey; Captain James B. Eads, B. Harrod, and Benjamin Harrison, civilians.

The work assigned to them was:

First—To direct and complete such surveys of the Mississippi river between the head of the Passes, near its mouth and its headwaters, as were then in progress, and to make such additional surveys and examinations of said river and its tributaries as might by it be deemed necessary.

Second—To take into consideration and mature such plan or plans as will correct, permanently locate and deepen the channel, and protect the banks of the Mississippi river, improve and give safety and ease to the navigation thereof, prevent destructive floods, and promote and facilitate commerce and the postal service, and with such plans to prepare and submit estimates of the cost of executing the work.

Third—To report specifically upon the practicability, feasibility, and probable cost of the plans known as the jetty system, the levee system, and the outlet system.

Many plans for the improvement of navigation and the protection of the alluvial lands have been advocated, chief among them these:

First.—Improvement of navigation between St. Louis and the Gulf by the use of jetties to make the river of uniform width and scour out the channel.

Second.—Drainage and reclamation of the alluvial lands by a system of outlets which divide the great river into several lesser streams.

Third.—To cut away the bars obstructing navigation by building a wall across the river at its mouth.

Fourth.—Construction of an entirely new line of levees a mile or more back of present ones.

Fifth.—Repairing existing levees, closing all the outlets with wing dams to turn aside the current where the curves of the river are apt to cave in the banks.

There are also three other plans proposed:

First.—The cut-off plan for straightening the course of the river.

Second.—The diversion of tributaries, like the Red river, diverting them from pouring into the Mississippi.

Third.—The reservoir plan, the creation of basins or reservoirs at the sources of the Mississippi and its tributaries to gather the surplus water in flood time and reserve it to add to the current at low water periods.

The majority report of the commission, signed by the president and engineers Suter, Mitchell, Eads, and Harrod, states that, "in a restricted sense as auxiliary to a plan of channel improvement only, the construction and maintenance of a levee system is not demanded. But, in a larger sense, as embracing not only beneficial effects upon the channel, but as a protection against destructive floods, a levee system is essential; and such system also promotes and facilitates commerce, trade, and the postal service."

The plan of improvement recommended is based upon the fact that the bad navigation of the river is produced by the caving and erosion of its banks and the excessive widths and the bars and shoals resulting directly therefrom. The work to be done, therefore, is to scour out and maintain a channel through the shoals and bars existing in those portions of the river where the width is excessive, and to build up new banks and develop new shore lines, so as to establish as far as practicable the requisite conditions of uniform velocity for all stages of the river. It is believed by the commission that this improvement can be accomplished below Cairo by contracting the low water channel way to an approximately uniform width of about 3,000 feet for the purpose of scouring out a channel through the shoals and bars, and by causing, through the action of appropriate works constructed at suitable localities, the deposition of sand and other earthy materials transported by water upon the dry bars and other portions of the present bed not embraced within the limits of the proposed low water channel. The ultimate effect sought to be produced by such deposits is a comparative uniformity in the width of the high water channel of the river. It is believed that the works estimated for in the report will create and establish a depth of at least ten feet at extreme low stages of the river over all the bars below Cairo, where they are located. It is also the opinion of the commission that, as a general rule, the channel should be fixed and maintained in its present location, and that no attempts should be made to straighten the river or to shorten it by cut-offs.

THE medicinal rule is that an elevation of 4,000 feet above the level of the sea confers immunity from yellow fever.

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FLOWERS AND THE WEATHER.

The vegetable kingdom opens up a curious field of investigation, in which the meteorologist will learn much regarding the mutual interdependence of all departments of creation. If light and electricity be, as well known, influential in exciting the movements of animals breathing the vital air, plants are equally subject to the same potent agencies, and testify to their influence so visibly as to attract the notice alike of the scientific botanist and of the illiterate rustic. In some parts of England the peasants mark the blooming of the large water lily, and think that the number of its blossoms on a stem indicates the price of wheat per bushel for the ensuing year—each blossom being equivalent to a shilling. We smile at this as superstitious folly; but even philosophers have not deigned to despise the weather indications afforded by the shutting of the flowers of certain plants.

Lord Bacon, for example, who was remarkably attentive to all the appearances and changes of natural objects, is the author of some of the observations which follow:

The Pimpernel (*Anagallis arvensis*).—"When the flower of this plant," says Bacon, "expands boldly and fully, no rain will happen for four hours or upward; if it continues in that open state, no rain will disturb the summer's day; when it half conceals its miniature flower, the day is generally showery; but if it entirely shuts up or veils the flower with its green mantle, let the traveler put on his great-coat, and the plowman, with his beasts of draught, expects rest from his labor." This little plant, from its peculiar susceptibility, has long been known as the "Poor Man's Weather Glass."

"The Siberian sow thistle (*Sonchus*).—If the flowers of this plant keep open all night, rain will certainly fall the next day."

"The African marigold (*Tagetes erecta*).—If this plant opens not its flowers in the morning about seven o'clock, you may be sure it will rain that day unless it thunders."

"The trefoil (*Hedysarum*).—The different species of trefoil always contract their leaves at the approach of a storm; hence these plants have been termed the 'Husbandman's Barometer.'"

"White thorns and dog-rose bushes.—Wet summers are generally attended with an uncommon quantity of seeds on these shrubs, whence their unusual fruitfulness is a sign of severe winter."

Besides the above there are several plants, especially those with compound yellow flowers, which nod, and during the whole day turn their flowers toward the sun. Such flowers are designated as "heliotropes," and the movement which they thus exhibit is called their "nutation." This is particularly observable in the common sow thistle (*Sonchus arvensis*); and it is a well known fact that a great part of the plants in a serene sky expand their flowers, but before rain they shut them up, as the tulip, for instance. The flowers of chick-wintergreen (*Trientalis Americana*) droop in the night, lest rain or moisture should injure the fertilizing pollen. One species of wood sorrel (*Oxalis*) shuts up or doubles its leaves before storms and tempests, but in a serene sky expands or unfolds them, so that husbandmen can foretell tempests from it. It is also well known that the sensitive plants and other species of *Cassia* observe the same rule. The flowers of the bindweed (*Convolvulus arvensis*), the wood anemone, and the common daisy (*Bellis*), even if already open, will shut up on the approach of rain. The last named flower appears to have derived its name—day's eye—from its sensitiveness to light. Such phenomena as these are probably determined by the action of light; and the flowers of such plants being shut at ten or eleven o'clock in the morning tell of clouds and gloom, and so predict rain.

Besides affording prognostics, many plants also fold themselves up at particular hours, with such regularity as to have acquired particular names from this property. Linnæus has enumerated forty-six flowers which possess this kind of sensibility. From an arrangement of such flowers it has been ingeniously proposed to form a floral timepice. The flowers of the goat's beard (*Tragopogon*) open in the morning at the approaoh of the sun, and, regardless of the weather, shut about noon, and hence its common name of "go-to-bed-at-noon." The star of Bethlehem expands its flowers about eleven, and closes them at three in the afternoon. The evening primrose (*Œnothera*) is well known from its remarkable properties of regularly shutting with a loud popping noise about sunrise and opening at sunset. After six o'clock, these flowers regularly report the approach of night. The flowers of the garden lettuce open at seven o'clock and shut at ten. That light is the chief agent of these changes seems to be proved by the experiments of De Candolle, made at the Jardin des Plantes, in an underground cellar, illuminated by lamps giving a light equal to fifty-four ordinary wax candles. By lighting these he could cause the flowers of the star of Bethlehem to open at pleasure, and also those of the sea camomile, which keeps its flowers closely shut during the night; but he could produce no artificial effect with the strongest light upon several species of wood sorrel, whose flowers and leaves are both folded up at night. With the sensitive plant he succeeded in so completely changing the hour of closure that on the third day from being placed in the lighted cellar it began to fold its leaves in the morning and open them in the evening. One of the most singular cases of the action of light on plants is that of the *Lotus* of the Euphrates, as described by Theophrastus, and which he represents as rearing and expanding its blossom by day, closing and sinking beneath the surface of the water by night, so as to be beyond the grasp of the hand, and again rising up in the morning to present its expanded blossom to the sun. The same phenomenon is also related by Pliny.

"Sheep Rot."

For some time a great mortality has prevailed among sheep, and the destruction reported is something appalling. The malady is popularly known by a very old Saxon name, "rot," and is in reality due to the presence in the liver and hepatic canals of numbers of the *Distoma hepaticum*, a trematode entozoon, as well as the *Distoma lanceolatum*, also a member of the same order. These entozoa, from their resemblance to the fish called "flukes," have received the same name, and have a particular predilection for the biliary apparatus, whose function they more or less destroy, and thus lead to the slow death of the sheep or other animals they may infest. After wet seasons, animals which have been pastured on tainted land are certain to suffer, from their having ingested with the herbage the ova of the Distoma. Pastures are tainted by "fluke" infested sheep, which pass the mature worms or their ova with the fæces, and these lodge on or are washed into the ground. The worms, of course, die, and the ova within them are liberated; and these, together with the free ova, appear to have not only a strong vital resistance to meteorological alternations, but also the good fortune to find a ready and acceptable intermediary host in the *Limnæus minutus*, a little mud snail common everywhere, and particularly on wet land. This snail becomes possessed of a number of ova in its interior, and during damp weather it crawls from its breeding place in the ground up the stalks of grass and herbage, and is swallowed by the sheep or other herbivorous animals when they are grazing. Received at first into the stomach, the ova undergo partial development, and then find their way into the biliary canals. If their number is considerable, when they have attained their full growth they dilate and obstruct these canals, the walls of which become considerably thickened. During their development the secretion of bile becomes gradually diminished, and that fluid is viscid, like mucus, and altered in color; at the same time the parenchyma of the liver becomes atrophied from the compression the "flukes" exercise upon it, and it may even become disorganized. Hence result icterus, disturbance in nutrition, anæmia, dropsy, and a general cachectic condition.

Sheep are not the only victims which suffer from the Distoma, for during the present mortality hares, rabbits, deer, and horses are said to have become infested, and died. The *Distoma hepaticum* has long been known to exist in the horse and ass, when they were allowed to pasture on unclean land during wet seasons.

Salt appears to be an excellent and well known prophylactic agent, and even a curative one when the disease has not made much progress. This beneficial action of sodium chloride has been known almost from time immemorial, and the freedom from "rot" of sheep which have been pastured on salt marshes has been also recognized for centuries.

The flesh of sheep which have been affected with this verminous disease cannot be said to be positively dangerous as food, though it must be greatly reduced in nutritive properties, as well as in quality. The human being may receive and harbor the Distoma, a fact worthy of remembrance. The present mortality is likely to render sheep scarce and expensive in this country for some time, and still further darken the prospects of our agriculturists.—*Lancet.*

A Deep Well.

The Continental Diamond Rock Boring Company, Limited, have lately completed for the Government of Mecklenburg-Schwerin a bore hole of exceptional depth, and the execution of which is of particular interest from the rapidity with which it has been completed. The boring, which was made for salt, is situated at Probst Jesar, near Lubtheen, and it was commenced on the 6th of July of last year, with an opening 12 inches in diameter. The first part of the bore had to be through a diluvial bed consisting mainly of drift sand and coarse gravel, and for sinking through this Kobrich's system was adopted, the diameter of the bore being maintained at 12 inches. The total depth sunk on this system was 98·05 meters, or 321 feet 8 inches, the sinking occupying 34 days of 24 hours each, of which 31 days were spent in actual boring and three days in sundry works. The average progress was thus at the rate of 3·163 meters per day, while the greatest depth bored in any one day was 7·496 meters, this being on August 11, 1879.

Below the diluvium the gypsum and rock were reached, and through this the boring was carried on with diamonds, the commencement being made on August 25, 1879, with a hole 10½ inches in diameter. Until a depth of 509 meters, or 1,670 feet, had been reached, however, no firm footing could be obtained on which to rest the tubing, and hence great annoyance was experienced from the falling in of masses of sand, the infalls being so great that sometimes when the boring rod was withdrawn the bore became filled up again to a depth of over 420 feet. The boring, however, was steadily proceeded with, and ultimately the final depth of 1207·25 meters, or 3,961 feet, was attained on the 6th of February last, the diameter of the bore at the bottom being 3 inches. The time spent in boring with diamonds was 163 days of 24 working hours.

The greatest progress made in any one day was on the 27th of January last, when a depth of 29 meters (95 feet 2 inches) was bored, this being nearly double the average progress. The total length of tube inserted was 1010·55 inches, or 3,315½ feet, the greatest length inserted in one piece being 456·424 meters, or 1,497½ feet, and this consisting of 7 inch and 8 inch tubes. Throughout the whole depth of the bore cores were drawn, some of these being salt cores over 2 feet long in one piece.

With the exception of a bore hole put down to the depth of 1,275 meters, or 4,183 feet, for the Prussian Government, a few years ago, and which took four years to accomplish, the bore of which we have been giving particulars is we believe the deepest yet sunk, and the fact that it was completed in less than six months speaks well for the skill and energy with which the work was carried out.

A Plan to Utilize Genesee Falls.

The Rochester *Democrat and Chronicle* of April 3 gives the following description of the Rochester Hydraulic Motor Company's plan for utilizing the water power of Genesee Falls:

The derrick, which is a miniature model of the one to be erected at the lower falls, stands in a room with the miniature machinery and airomotor. Water passes through small pipes and tubes into a flume at the upper part of the derrick, and has precisely the same effect, only in a smaller degree, as would the force of the falling waters of the Genesee exert in a proportionately gigantic flume. In the two perfectly gated compartments of the flume there are two metal siphons. By the time the gate has permitted sufficient flow of water to submerge the top of the siphon on either side the flow is stopped, and as soon as the water reaches the siphon's top the entire quantity within the reservoir discharges itself through the pipe of the siphon into another hydraulic process below. The two flume gates and siphons act alternately, and the double action progresses like clockwork. The water through the siphon pipe goes down into an air receptacle, the fall being five feet in the model, but twenty times as great in the motor itself, as designed to be erected, and as the five foot fall constitutes the amount of hydraulic pressure contained in the model, the proportionate force of the motor may be faintly imagined while noting the work of the small affair. Passing into the two air receptacles or cylinders (which lie in the water trough representing the river bed) the water surges down and compresses the air, which has already been admitted ahead of it into the cylinders. The water forces the volume of air forward into a drum, through another automatic closing valve. From the drum the air goes into the final air reservoir, where it remains compressed for use, and from whence it may be drawn off or distributed through the pipes to any desired point, for various uses. Even with this miniature model the air generated is very powerful, and will lift a heavy man right off the floor.

The original design of the inventor was to utilize the cataract of Niagara for running the machinery of Buffalo; but the falls and the city were too widely removed for this to be practicable at an expense of less than $2,000,000, so that Rochester was chosen as the ground for the test, and the lower falls of the Genesee as the water power. The derrick for the motor will be erected on the east side of the falls, where there is a natural cove in the rock for the works below. The frame of the derrick will be 125 feet high, rising slightly above the edge of the falls and about 25 feet from it. The dam already placed across part of the falls directs the water to a 16 foot bulkhead, and is bolted to the solid rock with 5,000 pounds of bolts. The water going through the bulkhead enters the flume and the reservoirs and siphons in the derrick. The siphons will be nearly 100 feet long, and the air receptacles or cylinders in the river bed (four in number) will each be 500 feet long and 6 feet in diameter. The company intend to erect a suspension bridge running from the west side of the falls to the derrick. The dam was built last fall when the water was low, and work upon the rest of the machinery will be commenced as soon as the weather permits. To state it briefly, the objects to which the company propose to devote this enormous and exhaustless power are these: To supply the city of Rochester and vicinity with a motor (in lieu of steam) for mechanical and manufacturing purposes—a motor capable of working every and all portions of the machinery in the city, with force enough reserved to supply compressed air and run all our street cars, unaided by any other propelling power. Also, "to supply the city with a light (in lieu of gas) cheaper, brighter, softer, and safer than the Edison horseshoe light." In this connection mention may be made of the fact that the company already produces a light which meets the description given—and where it costs a dollar a foot to generate gas, this light can be generated for a cent a foot.

In conclusion it may be added that the Motor Company has already made partial arrangements with the street railway company, so that at the works of the former at the lower falls the air cylinders to be put upon each car can be filled, in a few seconds, with enough compressed air to run them sixteen miles. The tracks of the Rochester City and Brighton Railroad Company are already laid to the site of the company's works, so that the cars can be supplied without any additional expense in this respect. The new power can be supplied at less than one-tenth the present cost of horse power, and yet allow a very liberal margin of profit to the motor shareholders.

A CHEAP black varnish for polished iron and steel, and which is said to be very good, is made with ten parts of oil of tar and one part of sulphur. This mixture, of a deep brown color, is applied with a fine hair brush, and then let to dry at a gas flame until the varnish becomes quite black.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

For the Development of New Ideas, try Anderson Bros., Peekskill, N. Y. Experience large.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Burgess' Non conductor for Heated Surfaces; easily applied, efficient, and inexpensive. Applicable to plain or curved surfaces, pipes, elbows, and valves. See p. 284.

Safety Linen Hose for hotels, factories, and stores, with or without couplings. Greene, Tweed & Co., 118 Chambers St., New York.

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

Power, Foot, & Hand Presses for Metal Workers. Moderate prices. Peerless Punch & Shear Co., 52 Dey St., N.Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

For Alcott's Improved Turbine, see adv. p. 270.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Removal.—Greene, Tweed & Co. have removed from 18 Park Place to 118 Chambers St., New York.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 300.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T. Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Eclipse Portable Engine. See illustrated adv., p. 284.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Loud Speaking Telephones, $5 a pair. Circulars for stamp. Agents wanted. Wm. R. Brooks, Phelps, N. Y.

Small High Speed Steam Yachts complete or in parts. Geo. F. Shedd, Waltham, Mass.

Wanted—A Specialty to Manufacture. Good Machine Shop. Wood Working Tools and Foundry. J. W. Murkland, Barton, Vt.

How to Lay Out the Teeth of Gear Wheels. Price 50 cts. Address Edward Lyman, C.E., New Haven, Conn.

Familiar as household words—the names of Esterbrook's celebrated Steel Pens—Falcon, Bank, and Easy Writer. To be had from all the Booksellers, Stationers, and Newsdealers.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 300.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 49 and 50 Astor House, New York.

Improved Work Holder for Lathes, Gear Cutting, Attachments for Lathes, Tyson Vase Engine, Small Steam Motor. No boiler, no danger. Send for new catalogue, 1880. Jackson & Tyler, Baltimore.

Artificial Ice Manufacturers and Brewers will find Anhydrous Liquid Ammonia, made by Larkin & Scheffer, St. Louis, greatly superior to other liquids. Packed in boxed cylinders provided with globe valves, containing from 70 to 125 pounds liquid, securing great saving of time and labor, as the cylinder is directly connected with the suction coil, and can be emptied in fifteen minutes.

Steel Figures, $1; Letters, $3 a set. York & Smith, Cleveland, Ohio.

Geared Power Press, cost $450, for $200. York & Smith, Cleveland, Ohio.

4 to 40 H. P. Steam Engines. See adv. p. 285.

A 60 to 80 H. P. Tubular Boiler, for cash, is wanted by John Hall, Fort Ann, N. Y.

15 H. P. Engines, complete order, $150. York & Smith, Cleveland, Ohio.

AUBURN, N. Y., March 1, 1878.

H. W. Johns M'f'g Co., 87 Maiden Lane, New York.

DEAR SIRS: In answer to your inquiry as to how we like your Paint, we are more than entirely satisfied with it. As you are aware, we are large users of paint, and of all that we have ever used, are satisfied yours is far superior; it is put on with less labor, covers better, flows more easily, has a better body, and, as far as our experience goes, will stand the weather better than any other paint we know of.

Your Roof Paint is unsurpassed; we used one coat on a tin roof, and to-day it looks as fresh and the color is as bright as when first applied. Respectfully yours,

JOSIAH BARBER & SONS.

Manufacturers of Woolen Goods and Carpetings.

We take pleasure in referring by permission to the above firm, and would caution the public against worthless imitations of our Asbestos Paints. The genuine bears the name of H. W. Johns on every package.

Forsaith & Co., Manchester, N. H., & 207 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Silent Injector, Blower, and Exhauster. See adv. p. 300.

Portable Railroads. Sugar Mills. Horizontal & Beam Steam Engines. Atlantic Steam Engine W'ks, B'klyn, N.Y.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page 301.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 300.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Valve Refitting Machine. See adv., page 300.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Blake Lion and Eagle Imp'd Crusher. See adv. p. 301.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

For Superior Steam Heat. Appar., see adv., page 301.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 301.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 301.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 317.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

New Economizer Portable Engine. See illus. adv. p. 300.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 300. Totten & Co., Pittsbugr.

We will purchase or manufacture on royalty, patented articles of real merit. Farley & Richards, Phila., Pa.

Lathes, Planers, and Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, NY., and 93 Liberty St., N. Y. city, U.S.A.

NEW BOOKS AND PUBLICATIONS.

AROUND THE WORLD WITH GENERAL GRANT. By J. Russell Young. American News Company, Publishers. New York.

Parts nineteen and twenty of this very interesting narrative of General Grant's tour around the world are just out, which complete the series. The author, Mr. Young, accompanied the General and his family throughout their travels, and he has given in these numbers a most interesting account of the places they visited, the curious customs of the people, and the regal manner in which the party were received and entertained by the kings and queens and other official dignitaries of the many countries they visited. The entire work contains some 650 pages, and embraces 800 well executed engravings of the most interesting places visited by the General and his party, and the most curious and wonderful objects they saw during their extended journeyings.

SMITHSONIAN INSTITUTION. BUREAU OF ETHNOLOGY. INTRODUCTION TO THE STUDY OF SIGN LANGUAGE AMONG THE NORTH AMERICAN INDIANS, AS ILLUSTRATING THE GESTURE SPEECH OF MANKIND. By Garrick Mallery, Brevet Lieut. Col. U. S. Army. Quarto, paper, pp. 72. Washington: Government Printing Office. 1880.

An exceedingly important paper, intended at once to indicate the scope and purpose of a work upon sign language in preparation by the Bureau of Ethnology of the Smithsonian Institution, and to call out interest and correspondence upon the subject. It gives, in the form of a vocabulary, a collation of all authentic signs, with descriptions of them, and of specially associated facial expressions, with engraved illustrations when necessary; also brief considerations of the practical value of sign language, the syntax of signs, origin and extent of gesture speech, modern uses of gestures and signs, etc.

MODERN OBSERVATIONS ON RIFLE SHOOTING, WITH AN IMPROVED SYSTEM OF SCORE BOOK. By Edwin A. Perry. New York: E. Remington & Sons. Pocket book form. Leather, pp. 139. Price $1.

This is the third edition, with additions, of Captain Perry's "Green Book," so widely and favorably known to long range riflemen. The additions embrace an article on long range with military rifles, and one on the long range tournament of last year, tabulating the results, and drawing from them such conclusions as the most advanced science of rifle practice seems to warrant. The book is all but indispensable to all who take a practical interest in the science and art of long range rifle shooting.

ENGINEER'S AND MECHANIC'S POCKET BOOK. REVISED AND ENLARGED. By Charles H. Haswell. New York: Harper & Brothers.

There are few intelligent mechanics and fewer engineers in the United States who need to be told of the existence and practical usefulness of "Haswell." The new edition—the thirty-sixth in number—has compressed within its 673 pages a marvelous amount of exact information, largely in the form of tables, formulæ and condensed statements of facts, carefully classified and well indexed. As a convenient reference book for the general reader it is scarcely less useful than for working mechanics and engineers.

THE SLIDE VALVE PRACTICALLY EXPLAINED. By Joshua Rose, M.E. Philadelphia: Henry Carey Baird & Co. Cl., pp. 100. Price $1.

Offers to practical men a clear explanation of the operations of each element in a slide valve movement, the effects of variations in their proportions being illustrated by numerous examples from recent successful practice. Thirty-five engravings.

PRACTICAL KERAMICS FOR STUDENTS. By C. A. Janvier. New York: Henry Holt & Co. 12mo, cl., pp. 258. Price $2.50.

The author has brought together, chiefly from authorities not easily accessible to students, a large amount of practical information touching the history, composition, manufacture, and decoration of all sorts of pottery, by which term is included all terra-cottas, earthenwares, stonewares, and porcelains. The matter is well chosen, concisely put, and admirably arranged. The book is well made and amply indexed.

BRAIN AND MIND; OR, MENTAL SCIENCE CONSIDERED IN ACCORDANCE WITH THE PRINCIPLES OF PHRENOLOGY AND IN RELATION TO MODERN PHYSIOLOGY. By Henry S. Drayton, A.M., and James McNeill. Illustrated. Cloth, 12mo, pp. 334. Price $1.50. New York: S. R. Wells & Co.

The authors have given with considerable ability a review of the system of mental science known as phrenology, with the relations of mind to anatomy and physiology as understood by phrenologists. The book contains a large number of engraved illustrations of that peculiar sort characteristic of works on phrenology.

VACCINATION TRACTS. London: William Young. 16mo, cl., pp. 320.

This volume comprises 1 to 14 of the anti-vaccination tracts, issued apparently by or for the Anti-Vaccination Society of England. They are made up chiefly of excerpts from all sorts of writings "scattered in pamphlets, newspapers, and other periodicals." Our opinion of the movement has already been given in this paper; and so likewise have the arguments of its friends.

THE FRUIT GROWERS' FRIEND: AN EASY GUIDE FOR THE RAISING OF FRUITS FOR PLEASURE OR PROFIT. By R. H. Haines. New York: American News Company. 8vo, paper, pp. 34. Price 30 cents.

A practical manual, arranged for ready reference, giving the newest and most successful ways of growing large and small fruits.

SPONS' ENCYCLOPÆDIA OF THE INDUSTRIAL ARTS, MANUFACTURES, AND COMMERCIAL PRODUCTS. Part 11. Treats of Coal Tar Products, Cocoa, and Coffee. 64 pp. Price 75 cents.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. H. K. asks if a blow pipe is operated by a force pump having a metal condensing chamber, will it blow a steadier stream, and also stronger, if the condenser is made of elastic rubber? A. An elastic chamber is unnecessary. The air itself is sufficiently elastic to cause a ready flow.

(2) J. L. asks: If a boiler has two safety valves, namely, two inches and three inches, and both weighted alike (half inch), which would blow off first, and why? A. The three inch valve would probably lift a little in advance of the other, as there is less proportionate friction.

(3) L. W. D. asks: What is the best material for filling the space between inside and outside boards of a refrigerator? A. Sawdust is generally used and answers a good purpose as long as it is kept dry. A simple air space is effective if the walls are perfectly air tight.

(4) H. A. S. asks: Which is the cheapest boiler that can be made to run an engine 4 inches stroke by 2 inches bore? Can one be made out of common gas pipe so as to run an engine of that size? A. Yes; make one out of gas pipe not less than two inches diameter.

(5) A. V. asks if there is any means of removing stumps other than by the use of machinery. A. The following has been recommended: In the top of the stump a number of holes, each capable of holding a pound or two of saltpeter (potassic nitrate), are bored, filled with the salt, and during the latter part of the fall kept full of water, which will dissolve the salt, and the solution formed gradually passes into the roots. In the early spring the same holes are to be filled for a week or two with kerosene oil, and finally the oil-soaked stump set fire to, when the combustion will proceed, aided by the oxygen of the niter, until the greater part of the roots are consumed, after the manner of a slow match.

(6) R. E. G. asks: Is there any way of drilling a small hole in glass? I wish to suspend a pane of glass by means of a thread or fine string. I have broken a large amount of glass in trying to bore a small hole in it, but have not succeeded. A. Use turpentine, and take care when the drill is about to break its way through the glass as the hole is finished.

(7) E. B. asks: How are glass water gauges cut off to proper lengths without breaking? A. One method employed by mechanics is to break off the end of a round file, say 1¼ inch, so as to obtain a sharp edge, then with it scratch a circle on the inside of the gauge, at the proper length, and it will readily snap off where the scratch is made. Another method is to file a nick in one side and place the thumbs opposite the nick and break the glass as a stick would be broken.

(8) A. & P. ask how to make a good tooth wash. A. Take sugar of milk 100 parts, pure tannin 15 parts, lake 10 parts, oils of mint, anise-seed, and orange flowers, sufficient quantity. Rub together the lake and tannin, gradually add the sugar of milk, and then the oils.

(9) T. L. C. asks how to make common polish boot blacking? A. Ivory black 1 part, molasses one-half part, sweet oil one-eighth part. Mix and stir in hydrochloric acid one-eighth part, and oil of vitriol one-fourth part. Dilute the acid with twice its weight of water before mixing. Another recipe is to take ivory black 4 lb., molasses 2 lb., sweet oil 1 lb., oil of vitriol 8 lb. Mix and put in boxes.

(10) C. U. B. writes: I am building a flat bottomed, stern wheeled boat, 60 feet long and 16 feet beam at the water line, drawing 18 inches. What horse power engines would be required to run her? A. Two engines 10 inch cylinder and 2 feet stroke. 2. Could I not use a central crank, and dispense with one engine? A. Yes, but your one engine must be equal in capacity to the two 10 inch by 2 feet stroke.

(11) A. G. writes: Cambridge Physics, article Philosophy, by Rolf & Gillet, says, page 243: "But very few substances expand when they become solid. Iron is such a substance, and it is owing to this property that it is so well adapted for castings. As it solidifies, it expands so as to completely fill the mould." If this is so why do pattern makers always make their patterns one-eighth of an inch on a foot larger than the casting required? A. The volume of iron in a molten state is less than when it is crystallized or solidified. It solidifies at a very high temperature, when it perfectly fills the mould. During the subsequent cooling it shrinks so that it becomes, when cold, smaller than the mould or pattern.

(12) E. L. M. asks: 1. In what numbers of the SUPPLEMENT can directions for making a Bell telephone be found? A. SUPPLEMENT 142 contains the information you desire. 2. Will it work without battery, through No. 17 iron wire, over a distance of 500 or 600 feet? A. Yes.

(13) S. E. J. asks why the axles and boxes to wagons, etc., are made on a taper, or smaller on the outer end than on the inside end of bearing, and would the axle being straight or crooked make any difference. I notice that all the builders make them in that way. What is the reason for it? A. All axles are not made with taper; when so made, the axles are set or bent so that the underside or wearing side of the axle is at right angle to the "dish" of the wheels. Axles are made tapering to facilitate the removal of the wheel. This would sometimes be very difficult were the axle made straight.

(14) O. R. L. writes: 1. In the SCIENTIFIC AMERICAN of October 11, 1879, you have a cut of the steamer Pellworm, dimensions as follows: Length 75 feet, beam 12, draught 3½, boiler 25 horse power. With the hydromotor which is represented in her you say she will make six knots per hour, and that the engine will give to the boat 40 per cent of the power generated. Now what I wish to know is at what rate per hour would the most advantageous form of engine and screw propel this same boat? A. 10 to 12 miles per hour, depending on model. 2. What percentage of the power generated would be given to the boat? A. 50 to 60 per cent, according to the size and proportions of the screw.

(15) H. H. M. writes: In SCIENTIFIC AMERICAN of March 6, page 159, is an article on etching on glass with diluted fluoric acid. Will you please inform me how to dilute fluoric acid, or what to dilute with, and the proportion? A. Dilute the fluoric acid with water.

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(16 J. M. asks (1) for the proportions for making rubber waterproof solution. How much rubber, how much bisulphide of carbon, and how much absolute alcohol? A. Caoutchouc (gum rubber) 1 oz., carbon disulphide, about ¼ pint rubber, and vice versa. 2. If you drop coal oil on a hot plate it will vaporize. Is that the same as gas; if not, what is the difference between vapor and gas? Will the vapor condense back into liquid, or how will you keep it in a state of vapor? A. A gas is distinguishable from a vapor by the fact that, as in the case of atmospheric air, it can only be condensed by great cold and pressure. The vapor of coal oil or petroleum is not such a gas. If, however, this vapor be brought into contact with intensely heated surfaces a considerable portion of it is converted into a gas as permanent as that used for illuminating purposes. It is used by some of our gas companies for enriching common coal and "water gas." Alone it burns with a very smoky flame, owing to its richness in carbon.

(17) R. D. asks: What is peroxide of manganese composed of, and where can I obtain such as is used for filling the porous cup of a Leclanche battery? A. It is a compound of the metal manganese with oxygen. It occurs native as pyrolusite. It can be obtained through any druggist. 2. How is hard rubber moulded such as is used by electricians? I can get this rubber in sheets any thickness, and I want to know if I can melt it and run it into any form I wish. A. It cannot be melted or moulded as you propose. See pp. 48 and 105, Vol 39, SCIENTIFIC AMERICAN.

(18) H. D. C. asks for a recipe of rubber cement that will cement together the edges or overlaps of thin sheet rubber. A. The rubber cement is prepared by dissolving finely cut pure gum caoutchouc in a sufficient quantity of naphtha. The naphtha is warmed by standing the vessel containing it in another containing hot water, away from fire.

(19) H. M. asks: What dye is strong enough and cheap enough to use as a test of suspected communication between a cesspool and a well? Can you suggest any better method than the use of a dye to learn if any communication does exist between the cesspool or well? A. The coal tar dyes magenta and fluoresceine have been employed successfully for similar purposes.

(20) G. W. H. asks how to make a good cement for wood with a light color. A. Dissolve best white glue in a sufficient quantity of strong hot acetic acid.

(21) J. H. F. asks: Do you know of any method whereby gray iron castings can be coated with brass to a thickness of one-sixteenth or more of an inch? A. We know of no better way than that of brazing on a shell of the requisite thickness.

(22) W. L. asks where to find information in regard to the distillation of turpentine and resin. A. Consult Knight's New Am. Mech. Dictionary, also Johnson's and Appletons' Encyclopædias. We know of no book on the subject.

(23) E. H. K. asks: What work on assaying could you recommend to me? Or is there anything in your paper that would give satisfactory information on metallurgy? A. Consult Percy's Metallurgy and Rickett's "Assaying and Assay Schemes."

(24) D. H. C. asks for the name or names of some complete and reliable book or work on assaying gold and silver, etc., from all kinds of quartz and rock and ore. I want some complete work on the above giving full details of the latest and best methods, giving materials, etc., used; name of book, price, address where to be had. A. See reply to E. H. K., this page. You should address booksellers who advertise in this paper for their catalogues and price lists.

(25) F. B. W. asks if Richard Trevithick, of Merthyr Tydvil, South Wales, ran an engine on rails before an engine was run on the Stockton and Darlington road, England. A. Yes, in 1803, in South Wales.

(26) A. M. R. asks: What is the composition of the gelatine transfer pad? A. See p. 235, Vol. 41, SCIENTIFIC AMERICAN.

(27) A. D. writes: I am desirous of using vulcanized India rubber for moulding purposes. Will you tell me the best method of reducing rubber to the proper consistency for that purpose, and if anything is required to harden it again? A. Vulcanized rubber cannot be reworked in the way you propose. See pp. 48 and 105, Vol. 39, SCIENTIFIC AMERICAN.

(28) C. W. V. writes: In your issue for February 28, 1880, Vol. 42, page 133, you give a receipt for guttapercha cement. What kind of pitch do you mean; that made from coal or that made from the pine tree? A. Pine pitch. The addition of shellac will harden it.

(29) S. L. H. asks for a receipt for making a solution to be used as sizing on white paper so as to prepare it for varnishing with alcohol varnish. A. Have you tried thin aqueous solution of glue?

(30) H. T. writes: 1. A piece of floor oilcloth has been laid and in use several months and still remains sticky to such a degree that chairs, tables, etc., placed upon it will adhere to it more or less. What is the cause, and how can it be remedied? A. Try the application of a moderately strong wash of acetate of lead in hot water. 2. By what process can the polish of black marble, such as cases of French clocks are often made of, be restored after having become dull by age or handling? A. Use fine moist rouge and chamois skin. 3. I have a piano of excellent quality in every way except that it will not remain in tune longer than about one week after tuning, owing, as I believe, to the tuning pins being too small or thin for their sockets. Can I remedy this defect by the application of any such substance as glue or resin or anything of that nature to the pins or sockets; if so, which is the best, and how should it be applied to obtain the best result? A. Get a new set of tuning pins of large diameter. 4. In our climate the felt with which the dampers and hammers of pianos are covered is generally damaged materially within a short time by moths. Could not this felt, before application, be impregnated with some chemical that would prevent the attack of the moths and that would not at same time produce deleterious effects upon the glue with which the felt is fastened to the hammers, or upon the strings where they are struck or touched by it? A. A little camphor sprayed on in alcoholic (absolute) solution does very well.

(31) J. R. C. asks how to remove castor oil and balsam fir from a camel's hair brush. A. Use oil of turpentine or ether.

(32) H. B. G. writes: In the *Scientific Record* of 1874, page 20, is a recipe for destroying hair. One of the ingredients is sulphhydrate of sodium. Now, is there another or common name for it, for I have been to every druggist in this vicinity; some say that they do not know what it is; others say that there is no such thing. A. Use ordinary chemically pure sulphide of soda (sodium sulphide), sold by dealers in laboratory supplies.

(33) W. P. writes: I have spilled a lamp full of coal oil on a Brussels carpet. How can I remove the spot or stain? A. Spread over the spot, above and beneath, warm pipe clay, and allow it to remain 24 hours; then brush it off and beat out the adhering portions with a light switch.

(34) L. F. asks: 1. What advantage is it in the gravity battery to have the copper on the bottom instead of having it suspended from a yoke? A. It is so placed because the cuprous solution is strongest at that point, and as a matter of convenience. 2. If you silverplate first with a striking solution and strong battery, why do you not finish with the same also; or what advantage is there to use a richer solution and weaker battery? A. A weak bath and strong battery, because a strong bath or long exposure in a weak one is apt to act upon the uncoated metal and render the deposit uneven; a weak current and stronger bath, because such a current produces a more regular and "freer" coating, and such a bath has less resistance and requires a smaller exposure of anodes and less attention. 3. Your receipts for striking solutions have to 1 gallon of water from ¼ oz. of AgCy, Vol. 40, page 124, 4; and 5 oz., Vol. 42, page 59, 4; and from 1 lb. of KCy, Vol. 40, page 124, 4; to 2½ lb. of KCy, Vol. 42, page 59, 4. A. As a rule, the former gives the best results, especially with the more positive metals; the latter works more rapidly and quite satisfactorily with copper and German silver, if the battery is rapid enough and the work properly trussed.

(35) S. E. T. writes: I am using water from a well at the bottom of which there is quicksand. The suction pipe is two or three feet from the bottom, yet there seems to be a sort of fine mud or sand-like deposit around and on the water gauges. I blow out about a foot of water from the boiler every other day. The water which comes out is clear and free from a deposit. I do not see why there should be an apparent deposit around and from the water gauges and still the water seem so clear. Can you help the difficulty by any explanation? Do you think there is any great amount of deposit or scale-forming material collecting on the interior of the boiler? When we are running the planer the water in the boiler seems to rise up or foam. Is there any remedy for it? A. The water should be first pumped into a setting tank and drawn from that to deliver to the boiler; two setting tanks used alternately will be necessary, except one tank be large enough for a day's work, and is filled in the evening, and the water allowed to settle through the night. We can give no opinion about the scale forming, without knowing the character of the water. The foaming may proceed from bad water, bad circulation, or scant steam room. The residue consists chiefly of a very fine, light silicious clay and lime.

(36) A. F. O. writes: In pouring the composition for my gelatin printing pad I am troubled with little bubbles, which leave troublesome depressions. How can they be avoided? A. Warm the vessel in which the composition is to be poured, and skim the surface by drawing a sharp edged piece of metal or cardboard over it immediately after pouring.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. L. S.—It is micaceous hematite. Its precise value here could only be ascertained by an analysis. Distance from railroad or navigable route, etc., must also be taken into consideration.—H. W. B.—It is chalcopyrite, an ore of copper—if found in sufficient quantity, of some value. —A. L. F.—1. Clay slate containing iron pyrites. 2 and 3. Porphyry. 4. Iron pyrites in altered dolerite.

COMMUNICATIONS RECEIVED.

On Mercury in Vulcanite Plates. By T. H. C.
On Ice boats. By T. D.
On the Power Used in Driving a Foot Lathe. By M.
On Ice Boats. By J. P. C.
Astronomical Notes. By W. R. B.
On Water Supply for Washington. By C. L. F.
On Repairing Spiral Springs. By E. N. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

April 13, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adjustable chair, M. F. Bell 226,475
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Galloons, doubles, Prussian bindings, braids, shoe laces, etc., R. Thorp & Sons 7,877
Guanos, superphosphates, and fertilizing compositions, R. W. L. Rasin & Co 7,872, 7,873
Hats, felt, Crofut & Knapp 7,875
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Soaps, S. W. Bell & Co 7,874

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Boot nailing machinery, A. Knowlton, Boston, Mass.
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Cocoanut oil, refining of, A. P. Ashbourne, Boston, Mass.
Grinding mills for wood pulp, G. King, Oswego, N. Y.
Hat brims, J. Peters *et al.*, Philadelphia, Pa.
Heat, utilizing from furnaces, A. H. Hearington, Rochester, N. Y.
Organs and apparatus for playing, G. H. Chinnock *et al.*, Brooklyn, N. Y.
Printing press, J. L. Firm *et al.*, —, N. J.
Saw sharpening machinery, G. W. Dudley *et al.*, Waynesborough, Va.
Screws threads, machinery for cutting, F. Armstrong, Bridgeport, Conn.
Telegraphic cables, manufacture of, M. M. Manly *et al.*, Philadelphia, Pa.

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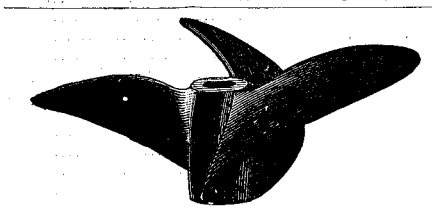

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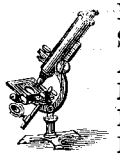

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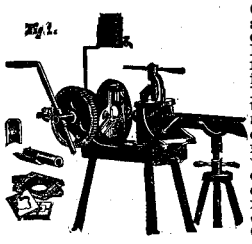

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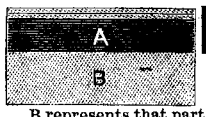

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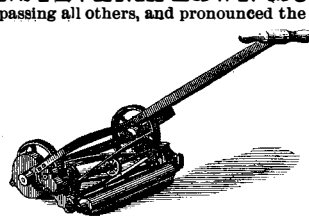
1880  1880

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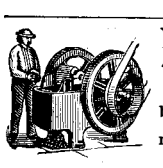

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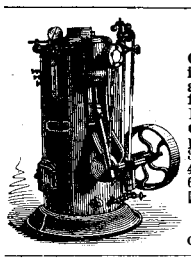

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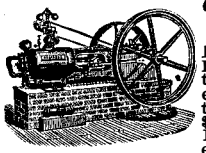

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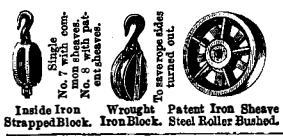

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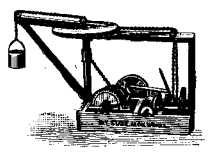

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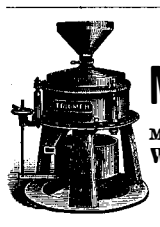

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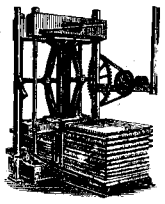

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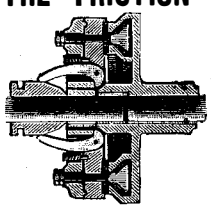

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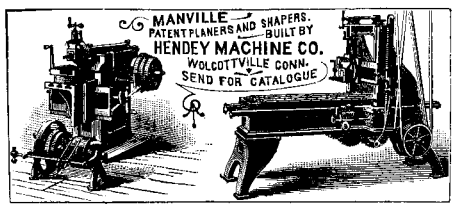

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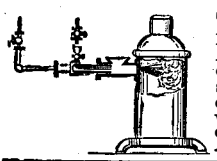

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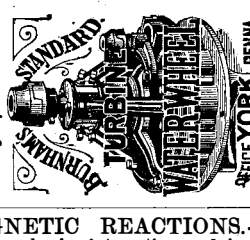

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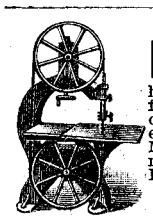

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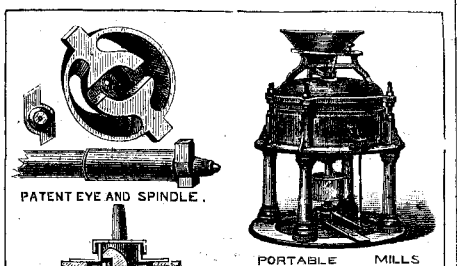

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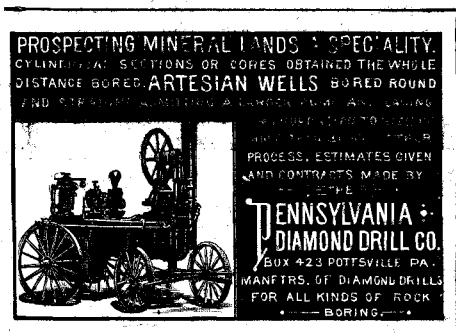
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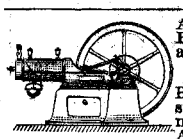

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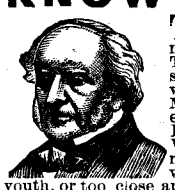

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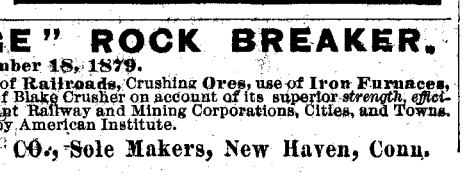

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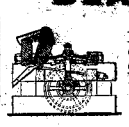

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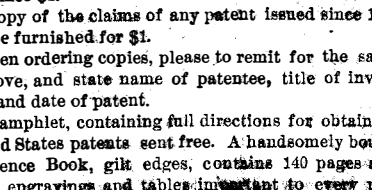

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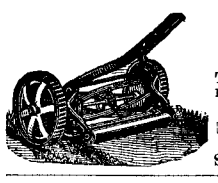

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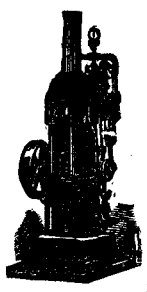

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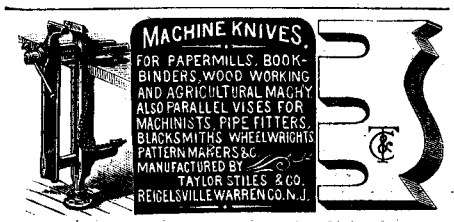
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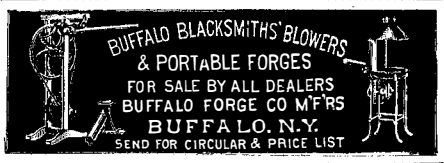

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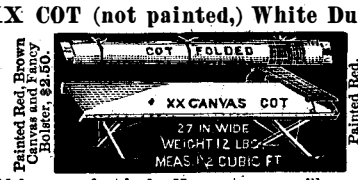
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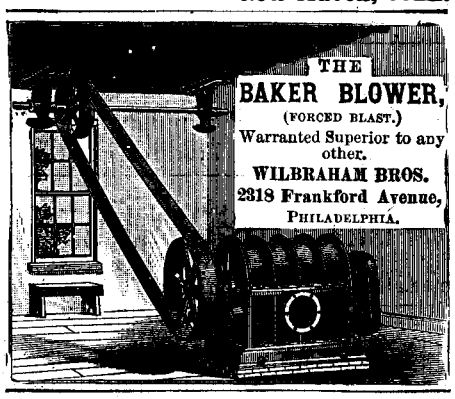

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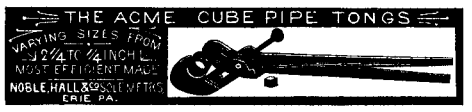

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